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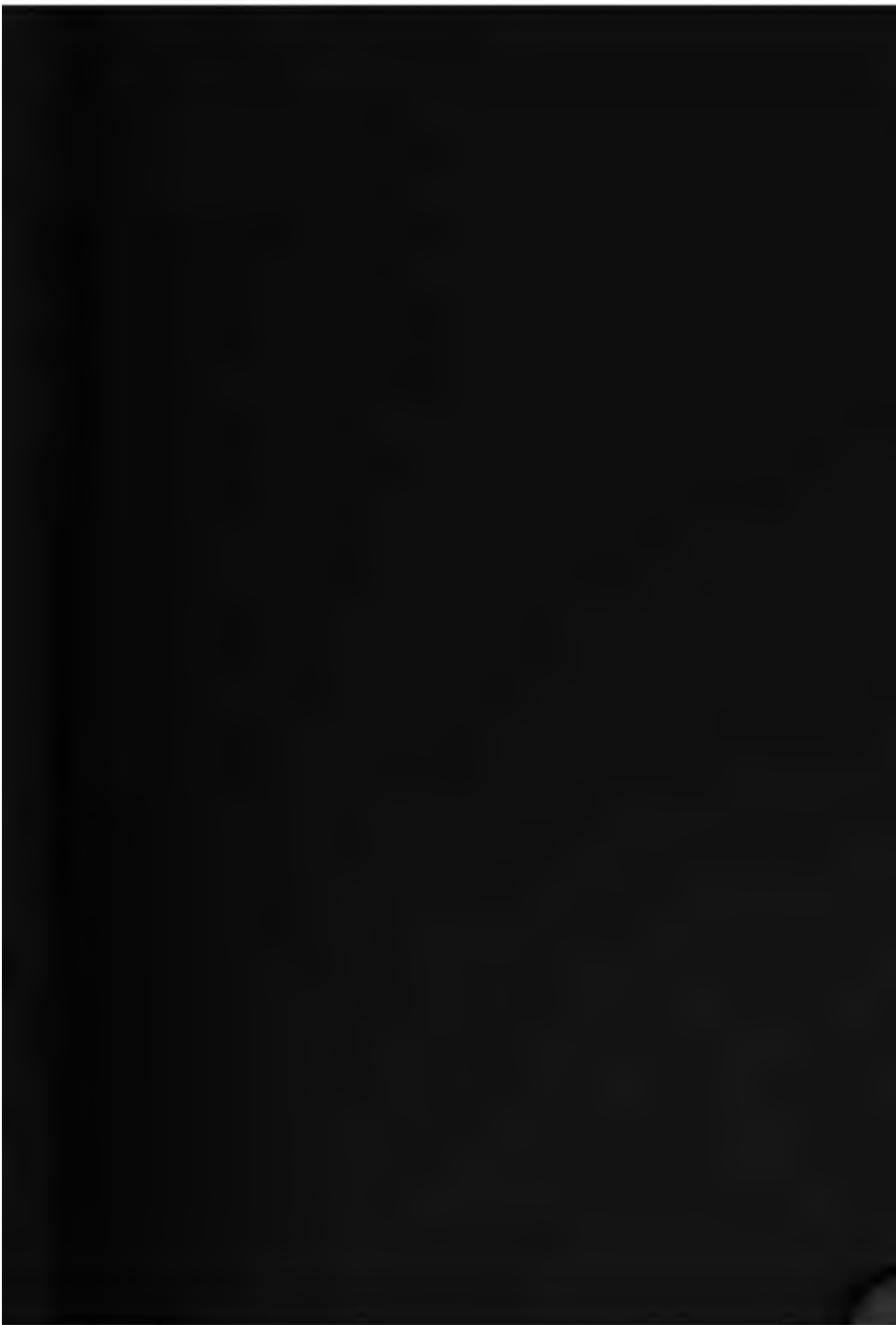
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K O U M I S S

OR

FERMENTED MARE'S MILK

"Even in Russia itself it was with difficulty I could learn the particulars of the preparation. . . . In the year 1781, when I first began to think of employing it in medicine, it was as little known in Russia proper as what it is now in Great Britain."—DR JOHN GRIEVE.

"Ce ne serait pas trop présumer de la bonté de ce remède que de prédire que dans quelques années, les malades atteint de la phthisie, ce terrible fléau de l'humanité, renonceront aux voyages de Madère, du Cairo, d'Ems et des Eaux Bonnes pour se diriger vers les steppes de la Russie, et se rendre à Samara, Orenbourg et les autres contrées analogues au l'on prépare le meilleur Koumiss."—DR KARELL.

K O U M I S S

OR

FERMENTED MARE'S MILK

AND ITS USES IN THE TREATMENT AND CURE
OF PULMONARY CONSUMPTION AND
OTHER WASTING DISEASES

WITH AN APPENDIX ON THE BEST METHODS OF
FERMENTING COW'S MILK

BY
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for Consumption and Diseases of the
Chest ; &c. &c. &c.



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MDCCCLXXXI

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TO
WILLIAM T. GAIRDNER, M.D.
F.R.C.P.E.
PROFESSOR OF THE PRACTICE OF MEDICINE IN THE
UNIVERSITY OF GLASGOW, ETC.

MY DEAR DR GAIRDNER,

I have taken the liberty of dedicating this small work to you, not because I consider it of sufficient merit to prove worthy of your acceptance, but as a slight token of my gratitude and kindly feeling towards an old and valued master, to whose teaching and writings I owe much of the little I know in practical medicine, and at whose hands I have received many favours in times gone by. That you may be spared to instruct as many generations of students in the future as you have done in the past, and that you may long continue to shed lustre on the profession to which you belong, and the University that has had the extreme good fortune to secure your services, is the earnest desire of,

MY DEAR DR GAIRDNER,

Your former Pupil,

THE AUTHOR.

P R E F A C E.

THE treatment of consumption and other wasting diseases by fermented mare's milk has of late years attracted considerable attention, not only in Russia but in other parts of Europe; while many physicians, and some of the leading medical journals in Great Britain, have on several occasions expressed a desire for a more intimate acquaintance with the koumiss cure. No apology need therefore be offered for attempting to supply such a want, although forgiveness is craved for the many shortcomings and imperfections of this essay.

When I first visited the steppes in 1871, it was more as a tourist than for the purpose of inquiring into the fermented mare's milk cure, of which, in common with many physicians at St Petersburg, I then had the haziest notions. After observing the results of the treatment of consumption at the vari-

ous koumiss establishments in the government of Samara, however, I, as well as the late Dr Boreisha, in whose company I travelled, became fully convinced of the extreme importance of fermented mare's milk as a therapeutic remedy. Since 1871 I have journeyed to the steppes on six different occasions, and each journey has only tended further to confirm first impressions, and to strengthen my opinion in regard to the efficacy of koumiss in phthisis pulmonalis. Thus some of the invalids who had undergone the koumiss cure, and whose cases are cited in this work, have been watched by me for as long a period as ten years; while several who had suffered from consumption from fifteen to twenty-two years ago, are still alive and hearty, and have been able to communicate to me the magic influence of fermented mare's milk in arresting their malady.

Should the arguments and facts here brought forward in favour of koumiss induce consumptive invalids to visit the Russian steppes, or tempt other sufferers to give fermented *cow's* milk, as the next best thing to mare's, a trial, I shall feel rewarded for my labour, as I am firmly convinced that the majority of these patients will be greatly benefited, and some will be cured, by adopting a treatment that has succeeded so well in other cases.

In conclusion, I must express my deep sense of obligation to Dr Postnikof and the late Dr Tchembulatof, of Samara, who were always ready to elucidate any doubts or difficulties I had in regard to the preparation, the employment, or the action of koumiss; who showed me all their patients; and who, on many occasions, extended to me a hospitality which it will never be in my power to repay.

G. L. C.

3 MAXAMILIANOVSKY PEREULOCK,
ST PETERSBURG, 1881.

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KOUMISS;

OR, FERMENTED MARE'S MILK.

CHAPTER I.

SKETCH OF THE HISTORY AND LITERATURE OF KOUMISS.

THE steppes of European Russia, and of Central and South-Western Asia, are vast tracts of slightly undulating, treeless, virgin land. The soil ranges in quality from the rich, black, oily, vegetable earth, covering almost boundless plains, to the infertile, sandy, desolate waste. The climate is a purely Continental one,—*i.e.*, besides the seasons being well marked, the sky is generally clear and the air dry. The population is sparse, and consists for the most part of wandering tribes of Khirgiz, Bashkirs, Kalmucks, Tartars, or Nogayans—the latter being an offshoot from the Tartar race. They live in tents

from eight to nine months in the year, and roam within a certain range of their settlements, during spring, summer, and autumn. Their winter dwellings, in which they bury themselves at least three months out of the twelve, are simply deep pits dug in the ground, and covered by a rounded roof of thick felt, through which the light enters and the smoke escapes. Unwilling to till the ground, their only means of subsistence consists in the breeding of animals that are used for food and yield a staple article of diet, and which they can readily barter for grain, tea, cloth, sugar, and such other merchandise as their primitive mode of life may demand. Horned cattle—which require shelter during the winter months, are often decimated by the plague, and need considerable tending—are seldom bred by the poorer members of these roaming tribes. The rearing of sheep, which requires less care, is more common; while the camel, which manages to find sustenance in herbs that no other ruminant will touch, and procures its food from under the snow in winter, is pretty frequently met with. But their favourite quadruped is the horse. The nomad makes his winter coat, his boots, his flasks, churns, and jars of its skin, eats its flesh, and drinks its milk. It is to him what the reindeer is to the Laplander, or the

camel, "the ship of the desert," to the Arab. These steppe horses, whether of Khirgiz or Bashkir breed, are small, hardy, plump animals, possessing powers of endurance—whether of fatigue, cold, hunger, or thirst—unequalled in all probability by any other race of horses in the world. They are never under shelter, and have to provide food for themselves the whole year round. A number of the younger and weaker animals perish in winter, and make room for the stronger and more enduring. The men, during the cold season, suffer as much as their horses. Epidemics do their work, but fortunately these are only occasionally present; scurvy is seldom absent, hunger never.

With the advent of spring, however, the nomad quits the polluted atmosphere of his tent, mounts his horse, and is in the steppe from morning till night. The fresh and sweet grasses which cover the ground supply rich pasture to the thin, half-famished cattle, sheep, and horses. They rapidly recover lost flesh. The gravid mares foal, and yield milk in plenty. Of this milk the nomads, of both sexes and all ages, consume enormous quantities. It is not drunk in its raw state, but is first fermented, and this fermented beverage is known by the name of Koumiss, or Kamiz.

Now the remarkably rapid manner in which, after leaving his tent, the thin and wan nomad grows stout and regains his healthful look and ruddy complexion, had attracted the attention of travellers, and led to the idea of employing koumiss with the view of combating wasting diseases ; for it was observed that this wonderful improvement—generally within a few weeks—in the physical condition and appearance of these men, although partly due to the change from bad to good air, and from an indoor to an outdoor life, had to be referred chiefly to the addition of fermented mare's milk, unlimited in amount, to their usually humble and scanty winter fare.

Let us now inquire into the history of this interesting article of diet, and, as will presently be pointed out, highly important therapeutic remedy.

With the preparation and uses of koumiss, the nomad tribes of Southern and South-Eastern Russia, and of Central Asia, have been acquainted probably from time immemorial. Thus there can be little doubt that the Scythians, many centuries prior to the Christian era, had a knowledge of fermenting mare's milk, as the following lines from Herodotus tend to show : " Now the Scythians blind all their slaves to use them in preparing their milk. The plan they follow is to thrust tubes made of bone, not

unlike our musical pipes, up the vulva of the mare, and then to blow into the tubes with their mouths, some milking while others blow. They do this because when the veins of the animal are full of air, the udder is forced down. The milk thus obtained is poured into deep wooden casks, about which the blind slaves are placed, and then the milk is stirred round. That which rises to the top is drawn off and considered the best part; the under portion is of less account."¹ Now although the above passage does not clearly refer to koumiss "as the drink which the blind slaves prepared," yet such a conclusion is fully supported by recent discoveries in Southern Russia of certain Scythian utensils, ornaments, and works of art, which throw considerable light on the history and habits of this ancient people. Thus the famous Nicopolis silver vase or urn, recently dug out of a mound near the banks of the Dnieper, and now in the possession of the Imperial Hermitage of St Petersburg, dates four centuries before the Christian era, and has numerous figures of horses and men embossed upon it. While the men, in their features, dress, and manner of trimming their beards and cropping the hair, resemble the peasantry,

¹ History of Herodotus. By George Rawlinson. London : 1862. Vol. iii. pp. 1, 2.

and particularly the Don Cossacks, of modern Russia, several of the horses are exact counterparts of the present Khirgiz breed.¹ It is highly probable that those Scythians who remained a roving and pastoral people, retained the habit of consuming mare's milk in the shape of an effervescing drink, and carried the art of making koumiss whatever country they migrated to, and taught it to other nomads with whom they came in contact. Those Scythians, on the other hand, who settled down, and thus ceased being a purely pastoral people, had soon to curtail the size of their studs, partly from the want of sufficient grazing ground, partly because they found the rearing of sheep and cattle more profitable. There can be little doubt, too, that religion played a by no means unimportant part in favouring or

¹ Besides the original vase, which is always exposed for inspection at the Imperial Hermitage, admirable photographs of it have been published by Roettger, of St Petersburg; while drawings have also been made by the famous draughtsman Picard, and appended to the 'Reports of the Archæological Commission of 1867,'

Отчетъ Археологической Коммиссии за 1864 г.
and to the 'Antiquities of Herodotus's Scythia.'
Древности Геродотовой Скиаи.

Several excellent engravings of the silver vase are also to be found in Mr P. Polevoy's highly interesting work on the 'History of Russia in her Household Monuments,' vol. i. pp. 81, 83, 87.
Очерки Русской Исторіи въ памятникахъ быта.—П. Полевого.
Сиб. 1879.

discountenancing the spread of the employment of fermented mare's milk. Thus the nomads who adopted Christianity seemed at the same time to imbibe an unreasonable dislike, at times amounting to a fanatical hatred, to the use of horse-flesh or mare's milk. "Those who are Christians among them" (*i.e.*, the nomads), writes William de Rubruquis in the thirteenth century—"as, viz., the Russians, Greeks, and Albanians—will in no case drink thereof [koumiss]; yea, they consider themselves no Christians after they have once drunk it."¹

The nomads, on the other hand, who embraced Mohammedanism, retain to the present day as great an attachment to, and veneration for, the horse as their heathen forefathers did. Indeed, from the writings of Rubruquis and Marco Polo, it would appear that the hordes of Western and Central Asia, with Kublai Khan at their head, were not averse in the thirteenth century to adopt Christianity, and that this was not accomplished simply owing to the then

¹ 'Itinerarium fratris Willielmi de Rubruquis de ordine fratrum minorum Galli, anno gratiæ 1253 ad partes Orientales—in the Principal Navigations, Voyages, Traffiques, and Discoveries,' &c., &c. London: 1599. New ed., 1809. Vol. i.—HAKLUYT'S COLLECTION. "Christiani enim Ruteni, Græci, Alani qui sunt inter eos, qui volunt stricte custodire legem suam, non bibunt illud (cosmos): Imo non reputant se Christianos, postquam biberunt," p. 88.

Pope of Rome taking a deeper interest in worldly matters at home, than in spiritual abroad. If they had become Christians, it is probable that koumiss in the present day would have been but a dim tradition of the past.

The first time koumiss is mentioned by name is in the 'Ipatof Chronicles' of the twelfth century, where the following notice of it is to be found: "In 1182, Prince Igor Seversky was taken prisoner by the Polovtsy" (a nomad tribe of the Mongolian race, then inhabiting the south of Russia), "and the captors got so drunk upon koumiss, that they allowed their prisoners to escape;"¹ from which it may be concluded either that koumiss was stronger, or that people's heads were weaker, then than now.

In 1275, according to the same records, Daniel, Prince of Gallicia, had to make his obeisance to the Tartar chief Batiy, who received him very kindly, and inquired of him, "Do you drink our drink, mare's koumiss, Daniel?" "Up to the present, no; but I shall if you order me," was the answer. "You are now one of ourselves, a Tartar; drink therefore of our beverage." Daniel took some. He

¹ Лѣтопись по Ипатскому Списку. Изданіе Археографической Коммисіи. Спб. 1871 г.

(The Ipatof Annals. Edited by the Archæographical Commission. St Petersburg: 1871.)

then repaired to pay his respects to Batiy's chief wife, who received him hospitably, and who seemed softer-hearted than her husband, for she sent Daniel a skin of wine, with the following message: "You are not accustomed to our koumiss; drink then of the wine."¹

It is not until the thirteenth century, however, that anything like a distinct notice of koumiss is to be found; and the author who first gave an admirable account of its action, taste, and preparation, was William de Rubruquis, the great French friar and missionary, who wrote about his travels in Tartary in the year 1253. He calls the drink *cosmos*, however. "The same evening," he says, "the guide who had conducted us, gave us some *cosmos*. After I had drunk thereof, I sweat most extremely from the dread and novelty, because I never drank of it before. Notwithstanding I thought it very savoury, as indeed it was."²

It is pleasant to learn that the worthy monk was

¹ История Россіи. Д. Иловайскаго. Москва. 1880, стр. 460, часть 2-я

(The History of Russia. By D. Ilovyesky. Moscow: 1880. Vol. ii. p. 460.)

² "Illo sero dedit nobis garcio qui ducebat nos bibere cosmos; ad cuius haustum totus sudani propter horrorem et novitatem, qui a nunquam bibere de eo valde tamen sapidum videbatur mihi, sicut vera est."—*Op. cit.*, pp. 11, 87.

rewarded for so manfully overcoming his scruples, by finding the flavour of koumiss unobjectionable.

"Then," he continues, "they [the Tartars] taste it, and, being pretty sharp, they drink it; for it biteth a man's tongue like wine of *raspes* when it is drunk. After a man has taken a draught thereof, it leaveth behind it a taste like that of almond-milk, and makes one's inside feel very comfortable; and it also intoxicateth weak heads. It causeth urine to be voided in large quantity."¹

The writer who next refers to koumiss is Marco Polo, the Venetian, in his 'De Regionibus Orientales.' "Their drink," he says, speaking of the Tartars, "is mare's milk, prepared in such a way that you would take it for a white wine; and a right good drink it is, called by them *kemiz*."²

It has also been affirmed³ that Al Rhazis, the famous Arabian physician, gives an account of an effervescent drink made of milk; but I have been

¹ "Tunc gustant illud et quando est temperate pungitium bibunt; pungit enim super linguam sicut vinum raspei dum bibitur. Et postquam homo cessat bibere, relinquit saporem super linguam lactis amygdalini et multum reddit interiora hominis incunda et etiam inebriat debilia capita; multam etiam provocat urinam."—*Op. cit.*, p. 84.

² The Book of Ser Marco Polo, the Venetian, translated and edited by Colonel Henry Yule, C.B. P. 224. London: 1871.

³ Die Kur mit Milch (Molken, Kumys), von Dr Lersch. P. 69. Bonn: 1869.

unable, after a careful perusal of his works, to find anything answering to a description of koumiss.¹

For nearly five hundred years after these bold travellers wrote, no mention of koumiss, so far as I am aware, is to be met with in European literature; and it is only towards the end of the eighteenth century that it is again brought into notice. Thus Strahlenberg² was the first, after De Rubruquis, to give a description of the preparation of koumiss; but his method, although borrowed from, and said to have been practised by, the Kalmucks, most probably ended in failure. Neumann,³ a German, and Voltelen,⁴ a Dutch chemist, proved equally unsuccessful in their attempts to explain the nature and causes of fermentation in mare's milk. Pallas,⁵ while mentioning koumiss in his travels, also states that the Tartars during winter, when mare's milk fails them, prepare a wine from cow's. Gmelin gives an account of the distillation by the nomads of a spirit

¹ I consulted two different Latin translations of Al Rhazis—the one in the Imperial Library, the other at the Imperial Medico-Chirurgical Academy of St Petersburg.

² Beschreibung des Russischen Reichs, p. 319.

³ Chem. Experimental, t. i. part 2, p. 18.

⁴ Observat. de lacte humano cum asinino et ovillo comparato, p. 54.

⁵ Physicalisch. Reise durch einige Provintzen des Russischen Reichs, t. i. p. 316.

from milk; while Ozeretkowsky, in 1778, sent a graduation thesis, "*De spiritu ardente ex lacte bubulo*," to the Medico-Chirurgical Academy of St Petersburg.

But although the two last-named authors wrote about the spirit procured from koumiss, and not about koumiss itself, yet I have considered it necessary to cite them, as their opinions are valuable in regard to a question which will be discussed later on in these pages—viz., the physiological properties of alcohol obtained from fermented mare's milk.

Now all the travellers and writers just referred to considered koumiss to be simply the intoxicating beverage of certain nomad races. No one appears to have been struck by its remarkable nutritive qualities, since no one seems to have regarded it in the light of a food. The credit of being first to estimate the importance of koumiss as an article of diet, and of discovering its uses as a therapeutic remedy, belongs to Dr John Grieve, a Scotch surgeon in the Russian army, who, in the year 1784, sent a communication to the Royal Society of Edinburgh—of which he was a member—entitled: "*An Account of the Method of making a Wine, called by the Tartars Koumiss; with observations on its use in Medicine.*"¹ The article

¹ Transactions of the Royal Society of Edinburgh, vol. i., 1788.

is remarkable for its suggestiveness and the powers of observation and originality of thought displayed by its author. It is a pity that succeeding writers on koumiss, while obliged to refer to Grieve, have not taken the trouble of reading his communication, as it would have saved them the rediscovery of much that was known to him a century ago. Grieve, before he had been to the steppes (if ever he went there), came to the conclusion, from *a priori* reasoning, that koumiss would prove beneficial in the treatment of wasting diseases. After the return in perfect health of the first patient whom he sent to Tartary, Grieve commenced making koumiss himself.

"From the time I had heard of koumiss," observes Grieve, "I had conceived an opinion of its importance in the cure of certain diseases. I judged that a preparation of milk which would not be curdled by the juices of the stomach, while at the same time it produced all its nutritive qualities, with the super-addition of a fermented spirit, might be of essential service in all those disorders where the body is defective either in nourishment or strength."¹ Three patients—two phthisical, and one syphilitic—whom he sent to the steppes, all returned home stout, plump, and in perfect health.

¹ *Op. cit.*, p. 184.

Towards the commencement of the present century, Dr Haeberlein gave an excellent description of koumiss, having drank it himself for thirteen years, with the result that he greatly improved in health, after suffering from "spitting of blood, severe cough, thick, purulent, and mucous sputum in large quantity, hectic, insomnia, and prostration." After thirteen years' perseverance with the remedy, he died suddenly of hæmoptysis, in 1805. He was the first physician to try the therapeutic action of koumiss on his own person. From the year 1811, when Haeberlein's communication was posthumously published,¹ till the year 1857, several treatises on koumiss are to be found scattered through various periodicals, lay and medical, Russian and German. None of these pamphlets or articles, however—not a few of which were written by authors to whom the trifling circumstance of their never having tasted or even seen koumiss proved no obstacle to the expression of dogmatic opinions upon its therapeutic action—produced an impression on medical men or the public. It is true that occasionally a consumptive patient would brave the long, and at that time tedious, journey to

¹ "Commentationes de potu e lacte equino fermentato, confectio et usu medico," in the *Commentationes Societatis Physico-Medicin. Mosquensis*, vol. v. pp. 1, 2. 1811.

the Bashkir settlements of Orenbourg or Oufa, and, for the sake of drinking mare's milk, which could then be procured nowhere nearer home, would endure for many weeks the privation of every comfort pertaining to civilised life. But these cases were quite exceptional, and those who had once experienced tent-life among the nomads, with its filth, bad cookery, monotony, and want of medical care, rarely repeated the experiment, although many returned to their homes convalescent, or greatly improved in health.

In the year 1858, Dr N. V. Postnikof, who had been struck by the remarkable recovery of a phthical patient whom he had sent the previous summer to drink koumiss among the Bashkirs, started a regular establishment within four miles of Samara town and a mile of the river Volga, for the treatment of consumption and other wasting diseases by fermented mare's milk. The success which attended his enterprise induced others to follow his example, with the result that in a few years the fame of koumiss had spread throughout Russia, and its efficacy as a remedy for phthisis became known even in neighbouring countries. Before 1858 the number of patients who left their homes to undergo the mare's-milk cure could easily be counted by the dozen ;

now, according to Dr Shermazanof, there are nearly 1500 patients treated annually in the several koumiss establishments existing in the vicinity of Samara alone.¹

Thus to Dr Postnikof belongs the credit of bringing a most important therapeutic remedy within comparatively easy reach of those sufferers who desire or need not only mare's milk and the balmy air of the steppes, but a certain amount of comfort in their dwellings and food, and the advice and guidance of a physician as well.

Moreover, Dr Postnikof and the late Dr Tchembulatof—the latter of whom opened a koumiss establishment within forty-five miles of Samara in 1861—have done much to extend and simplify our knowledge of koumiss: firstly, by having taken its preparation into their own hands, instead of being dependent upon an ignorant nomad—always ready to make a mystery of his craft;² secondly, in drawing a distinct line between strong, medium, and weak koumiss; and thirdly, by pointing out the indications

¹ Вѣстникъ Водолѣченія. Январь 1881 г.

(Russian Mineral-water Messenger, January 1881, p. 26.)

² If I was somewhat astonished during my first visit to Samara to find Russian peasants—men and women—employed in the preparation of koumiss at Dr Postnikof's and at Dr Tchembulatof's establishments, I was still more struck on my second visit, four years

for the employment of each of these three kinds in the treatment of disease.

The first person to test the value of koumiss in hospital practice was Dr Neftel,¹ who, in 1859, treated fifteen soldiers with it, in the Orenbourg Military Hospital; while in 1861, Dr Zeeland² accompanied a party of phthisical soldiers sent by the Russian War Office to drink fermented mare's milk in the Bashkir steppes. Both these surgeons spoke highly of koumiss in the admirable essays they published on the subject. Indeed, so favourable were their reports, and so rapidly did the popularity of the remedy they extolled spread, that in the year 1870, General (now Count) Milutin, the humane Russian Minister of War, had a regular koumiss establishment opened in the government of Samara for the

later, to find that Tartars had replaced the Russians. The reason for such change was simple enough. Whereas the Mohammedans have a particular reverence for koumiss—its manufacture being a labour of love to them—the Russian peasant regards mare's milk and its preparation with the fullest indifference. On my third visit I observed Tartars at Postnikof's, Russians again at Tchembulatof's. In fact, both these physicians simply employ those who best carry out their directions. In all the other koumiss establishments I visited, either Bashkirs, Tartars, or Khirgiz had the sole charge of the mare's milk and its preparation.

¹ Würzburger Medicinische Zeitschrift, 1860. Erster Band. "Beobachtungen aus den Kirgisen Steppen."

² *Соврем. Медиц.* 1861—62.

(Contemporary Medicine, No. 52, 1861; No. 1, 1862.)

treatment of those sick soldiers who belong to the Kazan district (which includes three governments or counties) of the Russian army. The experiment proved thoroughly successful; and the encampment, in which there is room for 120 patients (100 soldiers and 20 officers) is still in existence, after ten years' trial.

I must also not omit to notice that Dr Zeeland was the first to give a chemical analysis of koumiss, and correctly to explain some of the changes that milk undergoes during fermentation.

In concluding this brief and imperfect sketch of the history of fermented mare's milk, a few words in regard to its literature during the last few years may not be out of place. From 1858 to the present day, several excellent pamphlets and articles have been published on koumiss, embodying the experience of those who had been to the steppes, had observed for themselves, and had carefully and dispassionately investigated its action in disease. And it is a rule to which, hitherto, there has been no exception, that since John Grieve's time not a single medical author practically acquainted with koumiss has failed to give it full praise as the best known remedy in consumption and all wasting maladies. The writings of Drs Grieve, Haerberlein, Homenko, Dahl, Maydell, Ucke, Neftel,

Zeeland, Postnikof, Bogoyavlensky, Polubensky, Stahlberg, Ebermann, Herzenstein, and Shermazanof, bear witness to what has just been stated, and display, in their praises of fermented mare's milk, a unanimity of opinion quite exceptional in the history of any therapeutical remedy. In the few rare instances where we find koumiss disparagingly spoken of, it is by authors whose acquaintance with the subject commenced in the library, and ended where it commenced. Thus the late Professor Lebert of Breslau, in his work on 'Diseases of the Chest,' of which 640 pages are devoted to tuberculosis, mentions the koumiss cure, and entirely condemns it from *a priori* reasoning, which, unhappily for his argument, is at variance with fact. "It is difficult to comprehend, from a theoretical standpoint," he observes, "the wonderful curative power of a drink chemically poor in casein and butter, and which does not present any other quality than that of a sparkling wine, unless the important influence of climate with which this cure is associated is taken into account."¹

"I am also unable to conceive," he continues, "how the large doses of koumiss which are necessary for producing its action can be well supported by

¹ Klinik der Brustkrankheiten, von Dr Hermann Lebert, p. 555. Zweiter Band. Tübingen: 1874.

the stomach." Now, whatever difficulties may lie in the way of comprehending, or accounting for certain phenomena in nature which go contrary to one's pet theories, the inexorable logic of facts will prevail in the long-run. Thus it is positively known that patients who resorted to the mare's-milk cure have recovered their health *without changing their northern residence* (and thus climate); and further, that even the civilised (and somewhat capricious) human stomach has strength enough to digest as large quantities as ten, fifteen, and occasionally even twenty bottles of koumiss per day, while the nomad is equal to the task of overcoming a couple of gallons at a sitting, and of repeating the experiment after the lapse of several hours.

It must be admitted, however, that in his 'Treatise on Phthisis,' published in French in 1879, Professor Lebert considerably modifies his previous rash statements by asserting that, "any way, it is certain that koumiss holds quite an exceptional position among fermented drinks."¹

Expressions of opinion have also been risked by those who, while unable to become practically acquainted with koumiss, have further spared them-

¹ *Traité clinique et pratique de la Phthisie pulmonaire, &c.,* p. 444. Par H. Lebert. Paris: 1879.

selves the trouble of even reading about it. It were impossible otherwise to explain the statements of Dr Pidoux, who, in a work on phthisis published in 1872, observes that "koumiss is employed in the steppes of Southern Russia, but that up to the present time the Cossacks were almost the only people who profited by the cure."¹

It so happens, however, that fermented mare's milk is known and used chiefly in South-eastern, and not Southern, Russia, and that the Cossacks never prepare or drink koumiss, which they regard with the same aversion that the Russian peasant shows to it in the present day, and that good Christians showed in Rubruquis's time.

A writer as little acquainted with the physical properties, as Drs Lebert and Pidoux are with the therapeutics and history, of koumiss, was the late Dr Edward Smith, who, in his book on 'Foods,' describes koumiss as "a fermented and intoxicating beverage *as thick as pea-soup*."²

Now, as a matter of fact, koumiss is no more thick than pea-soup is intoxicating. Indeed it would be much more pleasant to believe that the author of

¹ *Études générales et pratiques sur la Phthisie*, p. 508. Par H. Pidoux. Paris: 1874.

² *Foods*, p. 319. By Edward Smith, M.D., F.R.S. London: 1873.

'Foods' had never seen koumiss, than to admit the possibility of the unfortunate paupers in the London workhouses, of which Dr Edward Smith was "inspector and assistant medical officer," being supplied, under the name of "pea-soup," with an article thin enough to justify his comparison.

But the most rash statements and the wildest speculations in regard to the therapeutics of fermented mare's milk will be found in a graduation thesis, by Dr Boykof, on the 'Physiological Action of Koumiss.'¹ The author seems to consider that his experiments upon but one healthy individual entitle him to speak with the full weight of authority, and in disparaging tones, of the therapeutic action of a remedy which he had not the least chance—at any rate up to the date of the publication of his pamphlet—to employ in the treatment of disease. It will be perceived, therefore, that Dr Boykof's contempt for koumiss has not been bred by familiarity; and further, that all those who condemn fermented mare's milk, have never seen it employed in medical practice.

The literature of koumiss, during the latter half of the present century, has been enriched, on the other

¹ Материали къ вопросу о физиологическомъ дѣйстви кумиса. Диссертация А. Байкова. Москва 1876.

(Materials regarding the Physiological Action of Koumiss. By A. Boykof. Moscow: 1876.)

hand, by the writings of Ucke, Zeeland, Neftel, Polubensky, Dahl, Postnikof,¹ Bogoyavlensky,² Hartier, Biel, and others; and the frequent quotations from, and reference to, their writings in this article, only proves how deeply I am indebted to them.

Having briefly and imperfectly sketched the history and literature of Koumiss, it will be necessary, before passing on to its properties, to devote some space to the chemistry of mare's milk, to a comparison between it and the milk of other animals, to an analysis of the changes which it undergoes during fermentation, and to a consideration of the products which are the result of such change.

¹ О кумисѣ, его свойствахъ и дѣйствіи на человѣческій организмъ. Н. В. Постникова.—Самара, 1873 г.

(On Koumiss: its Properties and Action on the Human Organism. By N. V. Postnikof, M.D. Samara: 1873.)

² Полное Практическое Руководство приготовленія и употребленія кумиса. П. М. Богоявленскій.—Самара. 1863 г.

(A New Practical Guide to the Preparation and Employment of Koumiss. By P. M. Bogoyavlensky. Samara: 1863.)

CHAPTER II.

ON MARE'S MILK, AND A COMPARISON BETWEEN IT AND THE MILK OF OTHER ANIMALS.

Mare's Milk.

MARE'S milk is an opaque, bluish-white fluid, of thinner consistence than cow's milk, of an invariably alkaline reaction, and a specific gravity varying from 1032 to 1035. It is of a pleasantly sweetish flavour, like almond-milk, and leaves no thick or creamy after-taste on the tongue. When taken fresh from the animal, it has a peculiar though not disagreeable smell, which it loses on being cooled down. When left standing at a low temperature from 12 to 36 hours, a thin layer of cream forms on its surface. The butter obtained therefrom has little firmness, and resembles hot boiled fat in appearance.

Several analyses—some of them by eminent chemists—have been made of mare's milk, and the results arrived at prove its extreme richness in lactine, and

poverty in casein and fat. The following are among the best known and most recent analyses of mare's milk, which contains, in 1000 parts, according to—

¹	² Moser.	³ Zeeland.	Hartier.		⁶ Biel.	⁷ Doyere.	⁸ Payen.	⁹ Vernois.	¹⁰ Müller.
			Steppe Mare. ⁴	Russian Mare. ⁵					
Casein and nitrog. subst.	16	29	14	20	26	22	16	13	14
Fat,	6	18	21	24	13	5	2	24	21
Lactine, . . .	47	36	73	59	54	55	87	33	72

¹ In this table, and in most of those that I shall bring together later on, I have omitted the fractions; when the fraction has been $\frac{1}{10}$ or above that, I have counted it as a whole; when under $\frac{1}{10}$, it has been scored out. The correctness of the table can hardly suffer therefrom; as throughout the amount of solid matters contained in 1000 parts of milk—not 100—has been taken into consideration.

² Journal für Biologie, Band i. p. 60, 1874.

³ Современная медицина. № 52—1861; № 1—1862.
(Contemporary Medicine, No. 52, 1861.)

⁴ Кумысь — его физиологическое и терапевтическое действие Спб. 1860 г.
(Stahlberg on Koumiss).

⁵ *Ibidem.*

⁶ Untersuchungen über den Kumys und den Stoffwechsel während der Kumyskur von Dr Phil. Biel in St Petersburg. Wien: 1878. P. 32.

⁷ Étude sur le lait, 1854.

⁸ Quoted by Pavy in 'Treatise on Food.'

⁹ Vernois et Becquerel, Mémoires sur le lait.

¹⁰ Cited by Lebert in 'La Phthisie Pulmonaire.' Paris: 1879. P. 443.

It will be observed from the above table that the percentage of sugar is extremely high, whereas the casein and fat are very small in amount. Moreover, of the several analyses just cited, two are worthy of special notice—viz., those of Mr Hartier of Moscow, and of Dr Biel of St Petersburg; for while the former chemist pointed out the difference between the milk of the steppe and the ordinary Russian mare (both animals having been kept in like conditions with regard to food and exercise), and further, showed that the milk of the Russian mare was thicker in consistence than that of the steppe animal,—the latter chemist, in three carefully conducted experiments with mare's milk, formed an estimate of the quantity not only of the casein contained therein, but of the lacto-albumen and lacto-protein as well. E. Millon and Comaille, the discoverers of lacto-protein, determined its quantity in different kinds of milk thus: in 1000 parts—

Cow's.	Sheep's.	Goat's.	Ass's.	Woman's.
2.9 to 3.4	2.53	1.52	3.28	2.77

Biel found in mare's milk, in 1000 parts, 6.13, 5.55, 4.88; and in koumiss, 5.71, 5.98, 5.85, 6.08.

As the particulars of Biel's three analyses of mare's milk have not been adduced in the general table, and as I shall subsequently have occasion to refer

to the results of his experiments, they are here quoted at length. In Biel's three analyses, mare's milk was found to contain in 1000 parts:—

	1st Expt.	2d Expt.	3d Expt.
1. Lactine, . . .	53.37	52.00	57.28
2. Fat,	11.58	11.08	15.62
3. Casein, . . .	18.23	18.18	13.09
4. Lacto-albumen, .	4.21	4.16	2.18
5. Lacto-protein, .	6.13	5.55	4.88
6. Volatile salts, . }	2.92	0.48	0.52
7. Fixed salts, . }		2.36	2.59
Total of solids,	96.44	93.83	96.16

Of the salts, fixed and volatile, Biel found that the proportion was four and a half of the former to one of the latter. Of both salts, free and fixed, he found, in 1000 parts of milk, from 2.8 to 3.1 parts. The distinguishing qualities of the casein and fat of mare's milk will be presently adverted to; meanwhile we must pass on to the consideration of one of the most important questions connected with our subject—viz., a comparison between the milk of the mare and that of the ass, the cow, and woman. In instituting comparisons, however, between mare's milk and that of other domesticated animals, it should be remembered that of the hundreds of analyses conducted by eminent chemists, of cow's milk for example, hardly two give the same results. Thus Professor Voelcker, in making three analyses of new

milk from the cow, found the fat as high as 76 parts in 1000 in one case, and as low as 18 in another.¹

Bouchardat and Quevenne in 23 analyses of cow's milk (in and near Paris) discovered the following striking variations of its component parts. The maximum of fat was 60 in 1000, whereas the minimum was as low as 26.80, or a difference of 33.20. The maximum of casein was 57.60; its minimum 37.80, or a difference of 19.80.

In the lactine, on the other hand, the greatest variation was 8.70.² "Several observers," says Bouchardat, "have remarked that the percentage of butter was the most variable, and of lactine the least of all the constituents of milk."

Such widely differing results obtained by well-known chemists in regard to cow's milk, only prove how inconstant is the percentage of solids in that fluid. And this fact should be borne in mind if the discrepancies which we have already seen in the table of analyses of mare's milk strike one as strange. These variations, however considerable, are slight when compared to the broad points which

¹ Book of the Farm. By Henry Stephens. Edinburgh: 1871. 3d ed., vol. ii. p. 260.

² Du Lait. Par Bouchardat et Quevenne. Paris: 1857. 2de Fascicule, p. 187.

serve as a rule to distinguish the milk of one animal from that of another. Thus ewe's milk, at its poorest, contains more casein than mare's at its richest. Mare's milk on the other hand, even with the smallest known percentage of sugar, holds that constituent in much larger proportion than bitch's milk ever does ; while the mammary secretion of the worst - fed goat yields more than twice as much butter as that of the best-fed mare.

In discussing the subject of mare's milk, and in pointing out in what respect it resembles and in what it differs from the milk of certain domesticated animals and of woman, it will be necessary to take the average results, and to draw our conclusions from the analyses supplied by several chemists. For the sake of lucidity, and with the view of making the points of difference more prominent, the analyses have been placed side by side in a tabular form :—

ACCORDING TO ANALYSES OF FOLLOWING CHEMISTS, 1000 PARTS OF MILK CONTAIN—

	DONKEY.		MARE.						WOMAN.					COW.									
	Doyère.	Payen.	Müller.	Doyère.	Payen.	Vernols.	Biel.	Zeeland.	Harter.	Moser.	Doyère.	Payen.	Bouchardat.	Chevallier and Henry.	Regnault.	Vernols.	Doyère.	Payen.	Voelcker.	Letheby.	Bouchardat.	Vernols.	
NITROGENOUS MATTERS AND FIXED SALTS.	21	17	14	22	16	33	26	29	14	18	38	2	14	19	15	44	42	45	35	41	41	55	41
	19		21						22					43					45				
Average, . .	19		21						22					43					45				
FAT,	15	14	21	6	2	24	13	18	21	6	17	52	21	36	26	27	32	37	45	39	36	37	
Average, . .	14.5		14						29					38					45				
MILK-SUGAR, .	64	64	72	55	87	33	54	36	72	47	70	88	75	65	49	39	33	53	45	52	54	36	46
Average, . .	64		57						64					64					64				

In compiling the above table, I have endeavoured to bring forward, where possible, the comparative analyses of cow's, mare's, and woman's milk, made by the same chemist, as in all such cases one is sure that identical methods of research have been resorted to. The three eminent chemists who have analysed each of these three kinds of milk respectively, were Doyère, Payen, and Vernois and Becquerel. Should, however, the results obtained by them be thought insufficient to draw conclusions from, I have added the analyses made by Biel, Hartier, Moser, Zeeland, and Müller, of mare's milk ; by Regnault, Chevalier and Henry, and Bouchardat and Quevenne, of cow's. From these analyses, all by eminent chemists, a pretty correct estimate may be formed of the average of solids in all the three kinds of milk. And of the three comparative analyses by Doyère, Payen, and Vernois and Becquerel, the last strikes one as somewhat strange, since the amount of sugar in mare's milk is stated to have been actually less, by 3 in 1000, than in cow's, while the fat of cow's milk in only 50 per cent more than in mare's. Doyère's table gives us 57 per cent less lactine, and 500 per cent more fat, in cow's than in mare's milk. In Payen's analyses, again, while the lactine is 62 per cent in excess in mare's milk when compared with

cow's, the fat is eighteen times smaller. In all probability the mare or mares experimented upon by Vernois and Becquerel must have been stall-fed, and have received an unusually large amount of fatty, and a remarkably small quantity of saccharine and starchy, matters in their food.

It will be observed, however, if we take the average of all the analyses brought forward, that mare's milk is poorer than woman's in every constituent—*i.e.*, in nitrogenous matters, in fat, and in sugar; very much poorer than cow's in butter, casein, and albumen, but richer than cow's in the amount of lactine it contains, and probably very much richer when the mare's have access to the sweet grasses of the steppes. These differences in the percentage of solids in the milk of various animals, were for a long time considered as being differences simply of degree; so that a dilution of cow's milk with a given amount of water, and the addition of a certain quantity of sugar thereto, was supposed to form a perfect substitute for woman's milk. The striking fact that the best of cow's milk, brought up exactly, by dilution and addition, to the standard (in regard to the quantity of each solid) of the human mammary secretion, disagrees with the stomachs of a very large percentage of infants, and that ass's milk is easily

borne by many invalids who are unable to digest cow's milk in any shape, although well known to every practising physician, had remained uninterpreted for many years. Recent chemical research has shown, however, how wide and essential is the difference between cow's milk on the one hand, and mare's and human milk on the other. Thus it has long been known that on the addition of vinegar to cow's and woman's milk respectively, the latter undergoes no appreciable change, whereas the casein of the former falls to the bottom of the vessel, in thick compact pellets. By the addition of muriatic, sulphuric, or nitric acid, at a low temperature, human milk remains unaffected, while the casein of cow's is precipitated in the form of thick curdled masses.

As far back as the year 1838, Simon, in his famous thesis,¹ directed the attention of the profession to the dissimilar manner in which the casein of cow's and woman's milk was in most instances affected by chemical reagents; but his explanation of the phenomena observed proved fallacious. He ascribed, —and his theory was adopted and extended by Scherer,²—the difference not to a diversity in the

¹ *De lactis muliebris ratione chemica et physiologica.* Berolini : 1838.

² *Wagner's Handwörterbuch der Physiologie.*

qualities of the casein, but to the inequality in the amount of the serum. The incorrectness of his speculation was demonstrated by Professor Kehrér, of Gießen, whose experiments led him to the conclusion that the casein of woman's milk is of a different composition, and that its atoms are otherwise arranged than those of cow's milk casein;¹ and also by Biedert,² who further proved that cow's and woman's casein do not lose their distinguishing qualities even when separated from the serum of the milk. Biedert's experiments, moreover, effected a regular revolution in the previously accepted views regarding the milk of various animals; for he proved what had been unsuspected before, that the difference between the casein of woman's milk and of cow's, was decidedly one of *kind* as well as *degree*. He found that cow's casein in a moist state is of a pure white colour, and that it presents, when dried, a light-yellow, horny mass; whereas the freshly precipitated humid casein of woman's milk has a more earthy or yellowish-white tinge, and is granular when dry. Cow's casein is of an acid reaction as a rule; woman's

¹ R. Volkmann's Sammlung Klinischer Vorträge. Die erste Kindernahrung, von Professor F. A. Kehrér, p. 525.

² Virchow's Archiv., Band lx. Ph. Biedert. "Neue Untersuchungen und Klinische Beobachtungen über Menschen und Kuhmilch als Kindernahrungsmittel."

is either neutral or slightly alkaline. Biedert also lays particular stress upon the fact that the dried casein of woman's milk is easily soluble in distilled water,—cow's almost insoluble. Lactic acid dissolves woman's casein without difficulty, whereas cow's casein remains either indissoluble or becomes only partly solvable, after continued agitation. Lastly, the casein of human milk is precipitated, on coagulation, in fine flakes, whereas the casein of cow's milk falls to the bottom of the vessel in the shape of thick, compact, lumpy masses.

These differences between the casein of cow's and woman's milk have been thus minutely dwelt upon for the reason that the latest experiments of Dr Langgaard conclusively prove how closely the casein of mare's milk resembles that of woman's, and how widely, therefore, it differs from cow's.¹ He found that the casein of woman's and mare's milk, when precipitated by alcohol, falls in fine flakes; cow's in thick lumps. This was not due to the greater amount of casein in cow's milk, for when diluted, even with double its amount of water, the reaction was the same. Dr Langgaard further discovered that

¹ Virchow's Archiv., 1875, Band lxxv. Verschiedene Untersuchungen ueber Frauen, Kuh, und Stuten-Milch, von Dr Alex. Langgaard.

the casein of woman's and mare's milk presents, when dried, the appearance of a fine yellow powder, whereas cow's has the shape of a cohesive, horny mass. With regard to the solubility of dried mare's casein in water, this physiologist considers that it occupies a middle place between cow's and woman's casein.

The conclusions he arrives at, after many experiments, in regard to the coagulability and precipitation of various kind of casein, are the following:—

1st, That the casein of mare's milk differs essentially from cow's.

2d, That mare's, though not identical with, closely approaches to, human casein.

It would be impossible to overestimate the importance of Dr Langgaard's experiments, which have definitively settled a much-vexed question with regard to the comparative value of koumiss prepared from cow's and mare's milk. Dr Biel has further demonstrated the following points of similarity between steppe mare's and woman's milk:—

1. Neither woman's nor steppe mare's milk coagulates completely on the addition of rennet.

2. On adding a few drops of acetic acid to new milk, or to milk slightly diluted with water, and on

shaking the fluid, the casein is precipitated imperfectly and in delicate flakes. The fluid is never clear but always milky after filtration.

3. The introduction of carbonic dioxide into this fluid does not further absolute coagulation.

4. Both kinds of milk are, on the contrary, completely coagulated by the addition of neutral salts, as, for example, sodic chloride, or Glauber salts, and heating. When filtered, the whey passes through as a clear fluid. But even in this instance the casein does not coagulate in large lumps, but presents the appearance of delicate flakes. But to this subject we shall return later on.

It remains to be added that mare's milk differs from cow's in the quality as well as quantity of the fatty matters it contains. Unfortunately we have no analysis, that I am aware of, determining the relative amount of the component parts of the fat of mare's milk—viz., of the percentage of the oleine, butyrine, stearine, caproine, capryline, caprine, myristicine, palmitine, butyne, &c. The subject is a very interesting one, and any chemist who would undertake to analyse the oil of mare's milk with the same care and minuteness with which Heintz and Chevreuil treated the fat of cow's, will place all

who take an interest in koumiss under a deep obligation. Imperfect as our knowledge is, however, there are certain broad points which in some cases enable us to distinguish the butter of one animal from that of another. Thus the fat of mare's milk differs from cow's in being more transparent, and only semi-solid in consistence, so that it can never, however energetically churned, be made firm.

This fact may be explained in the following manner. It should be remembered that, beginning with, and inclusive of, rutic acid, throughout the whole series of homologues upwards, all the fatty acids are solid at an ordinary temperature; and it is owing to the presence of a larger quantity of one or several of these, that cow's butter is hard, and to a smaller amount that the fat of mare's milk is oily, or rather like lard in consistence. Cow's butter, for example—which is composed chiefly of margarine, stearine, palmitine, myristicine,¹ oleine, butyrine, caproine, capryline, and caprine—owes its hardness, no doubt, to the presence of a large percentage of the five first-named glycerides; whereas the fat of mare's milk most probably

¹ Margaric acid, according to Heintz, does not exist in nature, being simply a union of palmitine and stearine, into which it can always be resolved.

contains those glycerides in excess which are oily at an ordinary temperature. Further, Mr Hartier of Moscow found that the fat in the milk of the ordinary Russian mare was thicker in consistence than in that of the steppe mare, although both animals were fed on the same pasture. It is also not unlikely, as suggested by Berzelius,¹ that the lactine of mare's milk differs from cow's, in so far at any rate as the ease with which it is decomposed by a ferment is concerned. But while many of these fine points in chemistry await solution, enough is already known to convince us that in mare's milk (and the component parts of ass's milk are in all probability identical with it in quality), containing as it does a large percentage of sugar, casein in a finely divided state, an albuminous solution in which part of the casein is dissolved, and a small quantity of fat,—thin in consistence and easily emulsionised,—we possess a fluid eminently fitted for fermentation. It is not to be supposed, however, that mare's milk, of whatever quality and whatever the percentage of its various constitu-

¹ "It is worthy of inquiry in what manner the sugar of milk in the genus *Equus* differs from the milk-sugar of the cow, and why it passes so easily into fermentation as compared with cow's lactine."
—Berzelius *Lehrbuch der chimie*, 4 Aufl. ix. p. 704.

ents, will, when fermented, pass into koumiss, or at any rate into a substance that can be employed as an article of food or as a therapeutic agent. This point will be considered later on, however. Meanwhile the chemistry of fermentation, in so far as it concerns the conversion of mare's milk into koumiss, will have to be considered.

CHAPTER III.

THE CHEMICAL CHANGES WHICH MILK UNDERGOES DURING FERMENTATION.

THE chemical changes through which milk passes during its conversion into koumiss, consist in the sugar undergoing the vinous as well as the lactous fermentations; in the greater part of the casein becoming separated from, while a smaller part is dissolved in, the whey; and in a slight decrease in the amount of albumen and lacto-protein, at the expense of which the ferments feed. The principal change, of course, is the conversion of a certain percentage of the lactine into alcohol and carbonic dioxide, with traces of glycerine and succinic acid, and of another portion of it into lactic acid. Now our object in the preparation of koumiss is to encourage, as much as possible, the vinous, at the expense of the lactous fermentation.¹

¹ It is questionable whether fermented mare's milk would not

This is accomplished partly by our resorting to artificial means, partly with the help derived from the laws that govern the lactous fermentation.

Correctly to comprehend in how far nature assists us, and how far art, it is necessary to guard against one commonly accepted error. Thus it is assumed by all writers on koumiss, as an incontrovertible law, that when yeast or any other ferment is added to milk, the vinous fermentation commences at the same time as the lactous, and continues side by side with it. There is a striking fact, however, which tells against such an assumption—viz, that milk-sugar undergoes the lactous, much more readily than it undergoes the vinous, fermentation. Thus, if we add yeast to mare's milk, the escape of bubbles of carbonic dioxide, and the vinous odour¹ rarely occur before the lapse of five hours (the liquid being stirred and kept at a temperature of from 80° to 90° Fahr.), whereas the production of a certain quantity of lactic acid is the almost immediate result of using a mixed ferment at the temperature indicated above. There can be no doubt, therefore, that the lactous precedes the vinous fermentation, in all cases where the

lose considerably as a therapeutic agent, were we able—which, in preparing koumiss on a large scale, we are not—wholly to prevent the formation of lactic acid.

¹ The proofs of alcoholic fermentation.

ferment contains the *penicillium glaucum* and the *torvula cerevisia*. Further, new milk, on exposure to the atmosphere for any length of time, sours spontaneously owing to a portion of its sugar having passed into lactic acid. Only a portion, however; for as soon as the amount of acid in the solution exceeds a certain limit, the process of lactous fermentation is arrested. Thus the greater part of the milk-sugar remains unchanged. Now the acidity which arrests the lactous fermentation during the spontaneous coagulation of milk, simply retards the process when a solution containing lactine is subjected to artificial fermentation and to agitation. But the acidity which in the one case arrests, and in the other greatly retards, the lactous fermentation, does not interfere with the vinous. To promote the latter, successive portions of milk are brought rapidly in contact with free oxygen and the ferment. This is accomplished by brisk and continued stirring of the fluid, which is exposed at the same time to the influence of the atmosphere. The important part which agitation plays in the chemistry of koumiss was fully appreciated by Grieve, who wrote: "The chief art of fermenting milk consists in agitation. The last circumstance has wholly escaped the attention of chemists. In fermenting vegetable juices

and infusions, nature has no need of the assistance of art; the intestine motion which accompanies the fermentation is sufficient to produce the degree of agitation which seems necessary to keep the parts of the fluids in contact, or to fit them for mutual action. Milk, on the contrary, is no sooner soured than a separation of its parts takes place. The cream rises to the top, while the cheese either falls to the bottom, or is suspended in the whey. When, however, these parts are brought in close contact with one another by agitation, and this repeated at proper intervals, a vinous liquor is produced.”¹

Now the free oxygen of the atmosphere not only promotes and hastens the vinous fermentation in milk, but it partially prevents the lactic from passing into butyric. Thus Pasteur asserts even that butyric vibriones are killed by free oxygen.² Butyric acid is, however, occasionally produced during the preparation of koumiss, and therefore under conditions where its development—admitting Pasteur’s theory—would be inadmissible.³

¹ *Op. cit.*, p. 184.

² *Comptes Rend.* 52. Feb. 1861.

³ Although free oxygen may interfere with, if it does not wholly arrest, butyrous fermentation. The presence of carbonic dioxide, on the other hand, seems to favour it; for Pasteur found butyric acid invariably present when a saccharine liquid, after having had the *penicillium glaucum* (which doubtless contained traces of the

When milk is subjected to a temperature not exceeding 78° to 93° Fahr., the following circumstances prevent, as a rule, the formation of butyric acid :—

1st, The more rapid lactous fermentation, the result of which is that the fluid soon becomes acid, thus preventing butyrous fermentation, which is a slower process, and best developed in a neutral or rather alkaline fluid.

2d, The comparative lowness of the temperature, butyric fermentation requiring 98° Fahr. to favour its production.

3d, The presence of air, and thus of free oxygen.¹

A frequent cause—whatever the chemical explanation thereof may be—of butyric fermentation during the preparation of koumiss, is the presence of too great a quantity of fat in the milk. This is an occurrence with which many of those who ferment mare's milk on a large scale are practically acquainted. Thus a day's pasture of the animal on rich grasses which contain a large percentage of oil, is sufficient to make the milk useless for preparing koumiss.

fermentum butyricum) added to it, is exposed at a temperature of from 86° to 95° Fahr. to carbonic dioxide instead of air.

¹ The formation of butyric acid during the fermentation of milk, must be regarded as a very rare, and, in most instances, avoidable accident.

So well, of late years, was Mrs Tchembulatof acquainted with this circumstance, that the mare's milk, before being fermented, was invariably tasted by her, and if found too creamy, at once laid aside as useless. Of course the milk, before being subjected to the above-mentioned test, was cooled down by being placed on ice, and the fat allowed to separate from the rest of the fluid. Further, too great richness of mare's milk was found not only to favour butyrous, but also to interfere with vinous, fermentation. It is owing most probably to the large percentage of butter in cow's milk that the preparation of koumiss therefrom so frequently ends in failure, and that it succeeds best where a considerable quantity of water is added to the milk, or where the milk is first skimmed.

.The strangest chemical phenomenon, however, in the fermentation of mare's milk, is the change the casein undergoes in regard to its solubility. Now, owing partly to the manipulation resorted to in fermenting mare's milk, and partly to the process of fermentation itself, we possess in koumiss an emulsionised fluid, in which the casein is suspended. When strong or medium koumiss has stood some time, a certain amount of casein is precipitated, and may, by filtration, be separated from the rest of

the fluid with comparative ease. After standing a still longer while, the percentage of free casein gradually diminishes,—in other words, it is absorbed by, or rather newly dissolved in, the fermenting liquid. Now the longer and the slower the process of fermentation in milk, the greater, as appears from the experiments of Biel, is the amount of casein which becomes re-dissolved in the fluid. "During slow and progressive fermentation on ice," writes Dr Biel, "and the increased pressure of carbonic dioxide, the casein undergoes a remarkable change—part of it is re-dissolved. The filtrate, however, no longer displays all the qualities of casein in solution; for, on being heated, there is no membrane forms on the surface of the liquid."

"The re-dissolved and changed casein differs essentially from albumen, from which it has been separated by me, and its quantity determined by mixing the clear liquid with the sodic carbonate in excess, and heating to boiling-point. The casein separates completely, whereas the albumen remains in solution."¹

Biel brings forward convincing proofs that the "amount of the (altered in quality) re-dissolvable

¹ Untersuchungen über den Kumys, von J. Biel. Dr Phil. Wien: 1874. P. 26.

casein increased with the age of the koumiss." Thus he found that in koumiss of two days' standing "11.75 per cent of the casein originally present had become re-dissolved." Further, in koumiss of

3 days' standing, 13.5 per cent			
5	„	23.75	„
9	„	22.5	„
16	„	35.5	„

of the contained casein had undergone solution.¹

The principal chemical changes, however, as has already been stated, that any of the ingredients of milk undergo when it is subjected to fermentation, are those through which the lactine passes. The decomposition of the sugar, in fact, and its conversion into alcohol and carbonic dioxide, with traces

¹ It is but right to mention that Mr Hartier of Moscow, several years previously, had made an analysis of two-days-old koumiss, and also of koumiss that had been kept on ice from September till February (*i.e.*, for five months.) From his experiments, it would appear that the amount of casein was exactly the same, after five months, as it was after two days' fermentation of the milk. Unfortunately no conclusions can be drawn from these analyses of Mr Hartier, for the simple reason that different samples of milk were used in the two experiments. This can be clearly proved by reference to his first table (two days' fermentation) where the quantity of fat is given as 2.05 per cent; whereas, in his second table, (five months' fermentation) the fat is placed at 1.01 per cent, or at less than one half. Now it is well known that the amount of butter, if it decreases at all, never falls off to half its original amount when kept in a fermenting liquid.

of glycerine and succinic acid on the one hand, and into lactic acid on the other, may be regarded as the essence of the fermentative process in milk—all the other changes being of secondary importance. And not only is the decomposition of the lactine essential to the fermentation of milk, but the very products of such decomposition—viz., the alcohol, the carbonic dioxide, and the lactic acid—are among the chief active agents in that complex therapeutic remedy called koumiss.

Now although, during fermentation, the quantity of lactine decreases progressively until the whole of it has undergone the vinous and lactous transformations, there is greater activity at the commencement than towards the termination of the process. Indeed it may be said that during the preparation of koumiss in the ordinary way, nearly two-thirds of the milk-sugar is decomposed within the first twenty-four hours; whereas after three days' fermentation, a sixth part of the sugar originally present still remains, and it is only after several months' fermentation (of course at a very reduced temperature, the liquid being kept on ice) that the lactine wholly disappears. Thus, again, to cite the results of Dr Biel's carefully made analyses, fifty-four parts of sugar were, on an average, found in 1000 parts of steppe mare's milk.

In koumiss one day old, only eighteen parts of lactine could be detected in 1000 of the liquid ;

in koumiss 2 days old,	.	.	14.5
„ 3 „	.	.	12.
„ 5 „	.	.	9.63
„ 9 „	.	.	7.79
„ 16 „	.	.	6.20

The amount of alcohol on an average in 1000 parts of koumiss¹ in—

1 day old, equalled	.	.	12.81
2 „ „	.	.	15.7
5 „ „	.	.	18.51
16 „ „	.	.	20.1

Hartier found in koumiss of two days' standing 16.5 parts of alcohol in 1000 ; and after five months, when not a trace of sugar could be detected, 32.3 of alcohol in 1000 parts of the fluid.²

Lastly, with regard to the lactic acid, Biel found, as the result of many analyses, that the lactic acid was, on an average, in 1000 parts of koumiss—

1 day old, .	.	.	.	4.75 parts.
2 days old, .	.	.	.	6.20 „
3 „ .	.	.	.	7.7 „
5 „ .	.	.	.	8.05 „
9 „ .	.	.	.	7.11 „
16 „ .	.	.	.	7.9 „

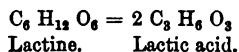
The quantity of the acid, therefore, when the fluid is kept on ice, does not, as Biel observes, “ seem to

¹ *Op. cit.*, p. 20.

² Stahlberg, *op. cit.*, p. 14.

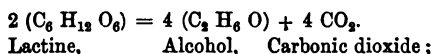
increase substantially after the lapse of a certain time."

Hartier's analyses, of which, unfortunately, he gives two only, were made on the second day and at the end of the fifth month of fermentation. He found, of lactine 11.5 parts in 1000 in the first case, and as much as 29.2 parts in the second. Such are the chemical changes which the constituents of milk undergo during fermentation. The most important of these, of course, is the decomposition of the lactine. A hundred parts of the latter, when undergoing the vinous fermentation, yield 47.12 of alcohol, 44.87 of carbonic dioxide, about 3.01 of glycerine, and 0.63 of succinic acid;¹ while the remaining portion separates as water, and is added to, or rather absorbed by, the newly formed ferment. Thus, nearly 92 parts of lactine resolve themselves into carbonic dioxide and alcohol, while the other eight disappear to form glycerine, succinic acid, and water, and partly to nourish the new-born ferments. The chemical equation of milk-sugar passing into lactic acid is simple enough, for one part of the former resolves itself, or rather splits up, into two of the latter, thus :—

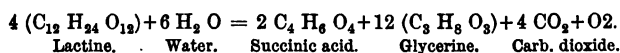


¹ These figures are only approximative.

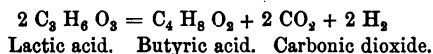
The equation for lactine undergoing the vinous fermentation is much more complicated, since we have not only alcohol and carbonic dioxide, but also glycerine and succinic acid as products of such change. The conversion of lactine into alcohol and carbonic dioxide is thus expressed—



while the following equation, proposed by M. Monoyer,¹ is quoted by Schützenberger² as the simplest for explaining the change of lactine into glycerine, succinic acid, and carbonic dioxide:—



The formation of butyric from lactic acid is represented by the following equation:—



In reviewing, therefore, the chemical changes through which mare's milk passes during its conversion into koumiss, it will be observed that the first result of the addition of a ferment is the appearance of lactic acid.³ As soon, however, as

¹ Thèse de la Faculté de Médecine de Strasbourg.

² On Fermentation. By P. Schützenberger. London: 1876.

³ Lactous fermentation, as we shall see hereafter, is even encouraged to a certain extent by the koumiss-maker, who, on

the liquid contains above a certain quantity of acid, the lactous fermentation either ceases for a while or progresses very slowly, and vinous fermentation commences. The casein is at first suspended in the fermenting fluid, but after a while a portion of it settles down in the shape of a thin, flaky sediment. The longer the process of fermentation in milk continues, the slower it becomes, so that it is only after the lapse of several days or weeks that the whole of the lactine disappears. Meantime a certain amount of the suspended or precipitated casein also decreases in quantity by being reabsorbed by the whey.

The whole of the protein compounds—the casein, albumen, and lacto-protein—fall off somewhat in quantity, since they serve as food for the ferments.

These are the principal chemical changes which occur during the transformation of mare's milk into koumiss. It will be necessary next to consider the question of the milk-supply before proceeding to a description of the methods of preparing koumiss.

adding a ferment to new milk, stirs the two for a quarter of an hour merely, and then lets them stand over night, the continued agitation being reserved for the fluid on the succeeding day.

CHAPTER IV.

ON THE MILK-SUPPLY—THE FOOD AND PASTURAGE OF THE
MARES—THE BREED EMPLOYED FOR MILKING PURPOSES
—THE METHOD OF MILKING.

WHILE it is important that we always have a supply of new milk in sufficient quantity for the preparation of fresh portions of koumiss, it is absolutely necessary that that milk possess certain properties, without which—excellent though it may prove as an article of diet—it will never effectively pass through the process of fermentation.

Thus, if milk be too rich, the excess of fat is apt to make it undergo the butyrous fermentation; if it contain too little sugar—a rare phenomenon in mare's milk—it will ferment too slowly, and the lactous will prevail over the vinous fermentation. So that the very properties for which milk is most highly prized when used in the unfermented state, retard, and even interfere, with its conversion into koumiss.

Now it has been proved by different observers in every part of Europe, and in a large number of experiments on various animals, how greatly the quantity of the milk is influenced by exercise, food, and drink. Thus the observations of Henry and Chevalier,¹ confirmed by Daniel and Joli and Filhol, show that the juicy grasses of spring sometimes cause an increase of 30 per cent in the quantity of milk yielded by the cow. Daniel² further found that cows receiving thirty litres of water per day gave no more than from six to eight litres of milk, whereas when sixty litres of water were allowed, twenty-five of milk were obtained. Playfair³ states that the quantity of sugar and butter decreases in milk in proportion to the exercise the animal takes; and he further demonstrated the incorrectness of Dumas's view that the fat of animals is wholly derived from the fatty matters contained in their food. From Playfair's experiments (on cows), it appears that the starch and sugar present in food contribute, along with its fatty materials, to the

¹ *Journal de Pharmacie*, tom. xxv. p. 339.

² De l'influence de l'eau et des aliments aqueux dans la production du lait. *Annales de Chim. et de Phys.*, tom. lxiii. p. 475. 1866.

³ *Trans. of Chemic. Soc. of London*, vol. i.; also *English Journal of Agricult.* vol. xiii. pp. 27, 28.

formation of butter. The observations of Frank¹ and Subbotin² on the milk of the bitch, led the latter to the conclusion that food has an important influence upon the quantity and quality of the milk, and that the solids decrease on a vegetable diet while there is a slight augmentation of the sugar. Dr Frank found that the use of lactine as an article of food largely increased the percentage of sugar in milk; and further, that an increase in the quantity of lactine was accompanied by a considerable fall in the amount of fat.³

Blondlot,⁴ on adding *cane-sugar* to the dietary of several animals, found the amount of lactine in the milk unchanged; but when *lactine* was given with the food, it was detected in very large quantities in the milk.

Further, it has been ascertained that cows less frequently milked will give richer milk, and conse-

¹ Къ вопросу о вліянїи пищи на количественный составъ молока. Диссертація. СПб. 1869 г.
(On the Influence of Diet on the Constituents of Milk. Thesis. St Petersburg. : 1869.)

² Virchow's Archiv., Band xxxiv. 1866.

³ Boussingault and Lebel are, if I mistake not (Annales de Physique et de Chemie, tom. vi. 1839) the only chemists who assert that neither pasturage nor food has any influence on the percentage of the solids in milk. Their experiments were confined to a few cows and a goat.

⁴ Mémoires de la Société des Sciences, 1878.

quently more butter. Hence in dairy districts cows are only milked two times a-day, whilst in the breeding districts they are milked three times.¹

Exercise, when considerable in amount, diminishes the quantity of sugar and butter in milk; when excessive it acts still more injuriously.²

Thus, from the important series of observations made by Henry and Chevalier³ on donkeys, it appears that "when the animals were overworked and jaded their milk became heated (*s'échauffe*), diminished in richness and volume, and soured rapidly."

Bearing the experiments and observations above referred to in mind, there can be no difficulty in arriving at the deduction that we are quite as able to regulate, within certain limits, the quality of the mammary secretion of the mare, as that of the cow and other mammals. It is wonderful, also, in how many respects the traditions and habits of the nomads, as well as the pasturage of the steppes they inhabit, have conduced towards their mares yielding a milk which possesses the qualities essen-

¹ Book of the Farm. By Henry Stephens. Edinburgh: 1871. Third edition, p. 260.

² Physiology at the Farm. By William Seller, M.D., and Henry Stephens. Edinburgh: 1867. P. 558.

³ *Op. cit.*, p. 346.

tial to easy and successful fermentation. Thus the Khirgiz and Bashkir mares are never used by their masters for riding purposes; for your true oriental, and more particularly one belonging to a nation of horsemen, would no more be seen astride a mare, than one of our spruce yeomen would appear at a review on the back of a cow. The animals, moreover, are further exempted from labour by never being harnessed in an equipage nor yoked to the plough. There are no vehicles save carts in the steppes, and these, as well as the plough and harrow, are almost always drawn by oxen. It would be a mistake, however, to suppose that the steppe mares endure no hardships, and that their life is one of pure and unalloyed pleasure. Fresh air they have in plenty, it is true—for they are not under cover either summer or winter—and sweet, rich grasses in abundance during eight months in the year; but the winter winds are biting, and the snow-drifts at times so heavy that the poor creatures are barely able, not unfrequently for several days in succession, to scrape the slightest pittance from under the deep-lying snow. A considerable number of the weakest, unable to resist both cold and hunger, perish. Indeed their acquaintance with the inclement weather commences at their very birth, for

March and April are the foaling months, and the temperature during that time of the year is very changeable.

It is not only against the treacherous elements that the young foal has to contend soon after it is brought into the world, but against the rapacity of its master, who, in milking the mother, deprives the offspring of a large part of its just heritage.

The mares are milked by the nomads from four to eight times a-day, and yield, on an average, from one half to two quarts on each occasion.¹ The foal is allowed to suck in the night-time only, and is separated from its parent during the day. At each milking, however, it is brought to its mother's side, and is occasionally even allowed to suck her for a few minutes, particularly should she prove restless. In the absence of the foal, the mare refuses to give milk—a well-developed sphincter round each nipple enabling her to carry out her resolution. A somewhat similar fact has been observed by M. Roulin² in Southern America, with regard to cows in a semi-wild state. It is there found necessary to allow

¹ The poorer nomads and those with large families milk their mares oftener—the rich, seldom.

² *Recherches sur quelques changements observés dans les animaux domestiques transportés de l'Ancien dans le Nouveau Continent. Mémoires de l'Institut de France, tom. vi. p. 334, &c.*

the calf to suck its mother and to be with her during the day, and to separate them at night, so that in the morning a small quantity of milk may be obtained from the cow. If the calf dies the cow gives no more milk.

The Khirgiz and Bashkir mares are only milked when gravid,—firstly, because the slight discharge of mucus from the vagina, so often observed when the nipples are stimulated by milking, is absent during the period of gestation; and secondly, because it is desirable that the animals should foal about the same time every year (the foetus being carried eleven months *in utero*). The mares are therefore covered within from two to four weeks subsequent to giving birth to their offspring.

The process of milking—a by no means easy matter—is generally effected in the following manner: At about six o'clock in the morning the mares are lassoed in the steppe, and driven towards the tents. The foal is then separated from its mother, and led to some shady place, within easy reach, where, with the other foals, it is (or ought to be) fed with a mixture of bruised oats and corn. After the lapse of a couple of hours, which is sufficient time for the re-accumulation of milk in the emptied udders, the foal is again brought towards its parent, but is not

allowed to suck, except for a few seconds, and only if the mare proves restless. Should the latter, however, show extreme excitability during milking, one of her legs, either the fore or hind one, is drawn by a rope towards the belly, and tied to it. The animal soon discovers that with only three legs at its disposal it has sufficient occupation in trying to keep its balance, and, fearing a fall, stands perfectly still.¹

As a rule, however, when the foal is brought to the mare, after a separation of a few hours, mutual joy is expressed by smelling and kissing each other, and neighing in happy undertones,—the maternal feeling being at times so intense that the milk flows from both nipples in an abundant and continuous stream. They are milked almost exclusively by the women, although the men are not ignorant of the craft. The milker stands on one knee to the right

¹ Haeberlein observes: "Equa nisi tranquilla mulsionem patiat, alter pedum posteriorum suspenditur loro, vel uncinus ad labium oris superioris adhibetur, usque dum bestia mulgere assueverit, et mulsionem haud secus ac vacca placide et tranquille patiat"—p. 92. Further: "Pulli cum matribus sunt pascendi; hæ enim a pulis separatæ morerent, atque lac paucius et minus salutare præbent, voluptate autem, quam pulli adpectus equæ affert, nec non suctionis stimulo lactis secretio augetur, idemque melius redditur. Eadem de causa, si pullo nimis mature uberum usus detrahatur, lac non mulgetur copiosus, quam ante pulli separationem."—*Op. cit.*, p. 93.

and close to the hind-legs of the mare ; while on the other knee, which is half bent—the attitude, in fact, assumed by desperate lovers on the stage when declaring their all-devouring passion—she rests the pail, and holds it directly under the udders. Then, placing one hand between the animal's legs, she pulls at each nipple in turn. When the milking is over, the mare is driven to the nearest grazing ground, and the foal is again separated from her. Towards about six o'clock in the evening, when the day's milking is finished, mother and offspring are led to the steppe, and there left together for the night.

The mares used for milking must be of the steppe breed. The fittest for the purpose have been selected by the nomads for many centuries, with the result that their udders, partly from being actively exercised, partly from the fact that other organs were kept as much as possible in abeyance, and partly from hereditary transmission, secrete, so far as is known, a larger quantity of milk, and a milk richer in sugar, than the udders of any other race of mares in the world. The very interesting experiments and analyses of Mr Hartier of Moscow, who fed an ordinary Russian mare and one of the steppe breed on the same pasture, showed that while the lactine

was 72 per 1000 in the milk of the latter, it was only 59 in that of the former.

The breed is hardy, moreover. A foal which, a few weeks after its birth, is deprived of its chief nutriment, and which has to provide for itself as best it may during the inclement weather in the bleak and snow-clad steppes, has its powers of endurance tested to the utmost. Can it be wondered at, then, that many of the young creatures succumb to a slow inanition; that a good number of them, even when grown up, perish from cold and hunger; and that the gravid mares often abort from the same causes?

It is a survival of the fittest, and it is astonishing what the fittest can endure. Thus Stahlberg relates how a foal that was brought into the world while he was driving his horses from the steppes to Moscow, managed, two hours after birth, to keep up with its mother, and to run nearly forty miles that day without showing any signs of fatigue.¹ Again, hardly anybody in Samara or Orenbourg would ever think of purchasing a *troika* (three horses harnessed abreast) unless they were able to cover sixty-five miles of ground at a brisk trot² without being fed in

¹ *Op. cit.*, p. 10.

² I have seen a Khirgiz horse which, with two others, had pulled

the interval. Their food, moreover, is of the simplest. Most of them never get anything but hay or grass, and it is not uncommon to see a steppe mare refuse, in its ignorance, barley, corn, and even oats,—as food to which it has all its life been a stranger. Everything, therefore, speaks in favour of the steppe mares being employed for milking purposes in preference to any other breed. Upon this point there seems to be no difference of opinion among all authorities, real or self-constituted, on koumiss. But although it seems definitively settled that koumiss should, if possible, be prepared from the milk of steppe mares, there is by no means the same unanimity of opinion with regard to the influence of pasturage on the mammary secretion. Thus Dr Stahlberg¹ has endeavoured to prove, or, more correctly speaking, has asserted, that the food of the animals has nothing to do with the character of the milk, and in support of his argument insists upon what nobody thought of denying, that race has an important influence on the qualities of the milk. That not only the quality, but also the quantity, of milk largely depends upon the breed of the animal, is a

a heavy four-wheeled vehicle seventy miles one July day, saddled for a long ride the next morning.

¹ *Op. cit.*, p. 56, &c.

truism which Dr Stahlberg certainly was not the first to propound; but that the milk of the very same creature may be made richer, or poorer, or sweeter, according to the pasture it is placed on, has been abundantly proved not only by physiologists and chemists, but by unsophisticated farmers and simple nomads, who, having no preconceived theories to uphold, are contented to watch nature, and humbly to learn the lessons she at times so lucidly teaches. Now it has been found that, although race plays a very prominent part in influencing the character of the mammary secretion, diet is a still more powerful and striking agent.

Thus the experience of many centuries has shown that pasturage has an important influence on the quality of the milk;¹ and so firmly were many of the older physicians convinced of this, that Galen recommended the feeding of cows, whose milk was used in the treatment of disease, upon certain herbs, such as *Cytisus polygamum auriculare*, *Triticum repens*, *Rubus caesius*, and *Achillea millefolium*;²

¹ "Milk is known to acquire poisonous properties from the nature of the herbage in certain localities without the animals themselves (cows, goats, &c.) being poisoned. This is noticed to occur abroad, and especially in Malta, and in some of the districts of North America."—Dr Pavy on Foods, p. 174.

² Lib. v. Method Med., chap. 12.

while Andrew Baccius, physician to Pope Sixtus V. in the sixteenth century, adverts to certain meadows having been reserved in Naples exclusively for medical use, as different plants were there cultivated, according to the directions of physicians, and these plants served as pasture for the animals that were kept to give milk.¹

The important part played by herbage in influencing the character of mare's milk had also forced itself upon the attention of several modern observers, who have had occasion to become practically acquainted with the preparation of koumiss. Thus it has been noticed that marshy ground and meadowland are totally unfit, however rich the pasture, for feeding milk-mares upon. Koumiss prepared from such milk causes purging and griping, and very easily undergoes decomposition.²

¹ Cited by Karell in his article on "The Milk Cure," Edin. Med. Journ., Aug. 1866, p. 99.

² This fact was well illustrated several years ago by the erection of a koumiss establishment—since come to grief—in an estate in the government of Saratof, where there was good meadow and marshy pasture, but no "kovil" (*Stipa pennata*). The result was exactly what might have been anticipated; nearly all the patients, soon after swallowing their portion of koumiss, brought it up, after laudable but unsuccessful efforts to keep it down. In the few cases where the stomach stood proof against the fermented milk, the intestines protested angrily, the expulsion of the troublesome guest being accompanied by griping and straining.

When the grasses are too rich—i.e., contain too much oil—butyrous fermentation is easily set up; when poor in starchy or saccharine material, on the other hand, they render the milk unfit for fermentation, because of the small per cent of lactine it then contains.

Further, there are certain plants which, while not interfering with the process of fermentation in milk, render it repulsive as an article of diet. Thus wormwood imparts to milk a bitter flavour; the wild onion and garlic, of which horses are fond, each its own characteristic nauseous and offensive taste.

The late Dr Tchambulatof, a careful and conscientious observer, who had spent most of his life in the steppes, and who was for nearly twenty years the proprietor of a koumiss establishment at which upwards of a hundred patients assembled every summer, informed me that the mares should never be allowed to eat of the following grasses,—the *Carduus circium*, the *Sonchus*,—particularly the *Sonchus arvensis*,—wormwood, chicory, wild garlic, and wild onion, as they all either interfere with fermentation, or impart an objectionable taste to the koumiss.

Now, as the preparation of koumiss requires much time and trouble, it is annoying to discover, after the

completion of the process of fermentation, that one's labour has been spent in vain, and that the liquid is undrinkable. In weak koumiss, it is true, one cannot tell by the taste whether it is made of good or bad milk, but the older the koumiss, the more thoroughly is the bitter, nauseous, or acrid flavour developed. I have thus, on several occasions, seen hundreds of bottles of fermented mare's milk thrown away¹ at the koumiss establishments, as totally unfit for human food.

Sometimes the koumiss "brew" goes wrong for several days in succession, and occasionally without any discernible cause, although in the majority of cases it can be traced either to ill-regulated temperature during its preparation, or to the ferment being of bad quality, but chiefly to the mares having been fed on improper pasture. In the large koumiss establishments, where hundreds of bottles are prepared daily, it is highly important that the causes of such mishaps should be discovered, and, if possible, removed.

¹ Perhaps I am wrong in using the expression "thrown away," for fermented mare's milk, however bad, and however repulsive to the patients, is greedily drunk by the less fastidious nomads, and with no apparent injury to their stomachs. It is thought a great sin to waste a drop of koumiss in the steppes; and when it is offered to you, it is necessary to drain the bowl to the last drop, or else run the risk of offending your host.

Mrs Tchembulatof, a lady who has always taken a lively interest in the preparation of koumiss at her husband's establishment, ascribes these accidents almost entirely to errors in regard to the food of the mares, and has shown in practice that in most cases these mishaps are avoidable. Thus she invariably tastes the milk before it is converted into koumiss, and can thus determine whether it is worth while subjecting it to fermentation. Much trouble is thereby avoided, and the production of bad koumiss easily prevented. The milk should be placed on ice first, and tasted when it is cold, for if taken warm, it is impossible to tell the difference between good and bad.

The bitter and nauseous flavours are easily detected, but it requires long practice and a very delicate palate to determine when the milk is just too rich, and thus unfit for the preparation of koumiss.¹

¹ Last summer, while making experiments for condensing mare's milk in the steppes beyond Orenbourg, I was surprised to find that the specific gravity of the milk varied from 1031 to 1035; while one day I was still more astonished to find the milk so fat, that after it was concentrated to dryness, it left a thick stain of grease when placed on paper. Further, in those portions of it which I condensed to one-fifth the original bulk, a thick layer of oil formed which could be poured off the surface. Such milk would of course have been totally unfit for fermentation. I could procure no information from the shepherd (he was a Khirgiz, and spoke no Russian) as to the pasture on which he had allowed the five mares, whose milk I experimented with, to graze that day.

Since the idea occurred to Mrs Tchembulatof of tasting the mare's milk before subjecting it to fermentation, and of condemning it if considered unsatisfactory, failure in the production of a palatable koumiss at their establishment is as rare an accident now, as it was a not uncommon one formerly.

It will be seen from the preceding, how irrefutable is the observation that pasture has a most important influence on the quality of milk, and how greatly the process of fermentation depends upon the constituents of the milk holding a certain relation to each other. This fact being once placed beyond dispute, the question which naturally next arises is the following—Do the grasses that the steppe mares feed upon differ from those we find in Central and Western Russia, and in the temperate climates of the European continent in general?

Now the principal grass that the fertile land of the steppes produces, and which sometimes stretches, with limited patches of other herbage between, for tens and even hundreds of miles, is the "kovil," or *Stipa pennata*, its Latin name being derived from its resemblance, when in flower, to a thin, wavy plume. When left unmowed it reaches nearly a yard in height; and even after having been cut down in summer, it grows, ere autumn is over, a foot and even

more. Kovil forms the chief food of the steppe horses, cattle, and sheep. It is the herb, *par excellence*, of a rich and virgin soil. Should the land be once ploughed up, no kovil appears on it for several seasons. After the lapse of from four to six years, if the ground is allowed to lie fallow, kovil springs up in small and rather bald patches, and twelve years are needed, as a rule, before it grows as uninterruptedly and thickly as before. It flowers in May and runs to seed in July. The mares eat it most readily in April, May, and June (it is then sweeter and most juicy), and sometimes even later, should the season prove rainy. During the whole summer, however, fresh portions of kovil continually keep cropping up.

Kovil hay is counted by Samara and Orenbourg farmers as their best and most nutritive grass; and cattle intended for market are fed and fattened exclusively on it. The rest of the steppe flora are, according to Zeeland,¹ the same as those encountered throughout the whole of Central Russia,—viz., the *Artemisia absinthium*, which sometimes covers tens of miles; the *Achillea millefolium*, and *folium serum*, which are also very common; the *Draba*; the *Sinapis*, and other *Cruciferae*; also the *Origanum*,

¹ *Op. cit.*, 1862, p. 13.

Thymus, Mentha, Salvia, Galeopsis, Veronica, Plantago, Alchemilla, Geum, Potentilla, Malva, Althea, Ranunculus, Senecio, Delphinium, Briza, Scabiosa, Euphorbia, &c., &c.¹

In our endeavours, however, to procure milk of a quality which fits it for fermentation, it is not sufficient that the mares be of the steppe breed, and that the pasture they are kept on be carefully selected. Plenty of water should also be within their reach, and salt should be allowed them *ad libitum*. If the animals have to travel several miles each time they need a drink, the quality of the milk suffers in consequence; a smaller quantity of it is secreted, and there is a falling off in the percentage of sugar and fat. Withholding salt, again, lessens the amount of milk and of the chlorides contained therein, and probably also hastens its decomposition. The best way

¹ Dr Maydell, besides giving a long list of medicinal plants which grow in the steppes, has the following remarks about the Orenbourg herbage in general:—

“Gramina herbæque lentissime crescunt, ut, quum primum nives evanuerunt, quam late prospectus patet, oculi, omnia pulcherrimo colore viridi induta videant. Primarium vero graminum genus, quod in locis inferius sitis non reperitur stipa pennata est, quæ uti tenuissima perquam longa atque prædura esse solet, ita florem longam albo colore et plumæ forma insignem emittens in regione deserta ubique cum absinthio mixta invenitur.”—Nonnulla Topographiam Medicum Orenburgensem Spectantia, p. 17. P. M. T. de Maydell, Dorpati.

of administering it is by placing large pieces of rock-salt, which the animals lick at will, in the steppe. The water-supply is a more difficult matter, for there are few rivers and hardly any open water in the steppes. The only way is to dig wells within easy range of the grazing ground.

It is also highly important that the animals be bathed frequently, and that their teats be washed with clean water and then dried, before and after each milking.

Thus, by selecting plump and healthy animals of the steppe breed, by placing them upon proper pasturage, and by attending strictly to the water and salt supply and to cleanliness, we shall, in most cases, obtain a milk admirably fitted for fermentation.

CHAPTER V.

THE PREPARATION OF KOUMISS.

IN the foregoing chapter, the points to be attended to in procuring a supply of mare's milk possessing qualities that favour, or at any rate do not retard or interfere with, the process of fermentation, have been dwelt upon at length. It is fully as important, however, but considerably more difficult, to manage and guide the details of fermentation through which the milk has to pass before it is converted into koumiss. Nothing is simpler than to set the process going, and nothing easier than to obtain koumiss of some kind or other, such, for example, as many of the nomads drink, and drink with apparent relish. But to produce koumiss of good quality, and which will agree with the delicate stomachs of most consumptive and dyspeptic patients, requires considerable observation, patience, and experience. Thus it not unfrequently happens, even at the koumiss establishments, and in

the hands of thoroughly practised brewers, that a whole batch of fermented mare's milk gets spoilt, and has to be thrown away as unfit for food. The causes of such accidents, which are exceptional, remain unexplained as a rule, owing to our imperfect acquaintance with the laws, or rather, many of the details, of fermentation. In most cases, however, provided certain points in regard to the quality of the milk, the ferment, the surrounding temperature, the vessel used, and the stirring, be carefully attended to, a palatable drink is produced.

Before proceeding to consider the preparation of koumiss, it will be necessary to give a description of, firstly, the vessels in which the milk is beaten up; and, secondly, a few of the substances employed for fermenting the milk.

The vessel used by the nomads in the preparation of koumiss is made of smoked horse-hide, the hair being turned outwards. It is a bag about three and a half feet long, somewhat conical in shape, with a broad base and narrow outlet, and is sewn together with thick threads, also prepared from horse-skin.

The disadvantages inseparable from a vessel constructed of horse-hide and used for the purpose of holding an acid and fermenting fluid, are obvious enough. It is impossible to keep it thoroughly

clean, as certain portions of the finely divided casein of mare's milk find a hiding-place in the seams of the vessel or *saba*, as the natives call it. The lactic and succinic acids, with which the sides of the vessels get impregnated, coupled with the casein undergoing decomposition in the seams, are apt, when a new batch of koumiss is prepared, to favour butyrous fermentation. To prevent this, the skin bags are turned inside out every fortnight, well washed with warm water, dried in the sun, and occasionally re-smoked. Koumiss prepared in the newly smoked vessels has a somewhat acrid taste, however.

To obviate these disadvantages, wooden tubs or cylinders were introduced some twenty years ago, and proved so superior in practice to the skin bags previously in use, as entirely to supersede the latter at all the koumiss establishments in the vicinity of Samara.¹ The wooden vessel now employed instead of the *saba*, is slightly conical in shape, being narrow above and broad below, and is made of a solid piece of oak (deprived of its tannic acid), fir, or limewood,

¹ Colonel Yule, the learned editor of Marco Polo, seems to doubt the possibility of the fermentation of milk being properly carried out in wooden vessels. So far from this being the case, I firmly believe that the koumiss churns of the future will be made of glass, which can with ease be kept clean, and which is also a bad conductor of heat.

the trunk of which is hollowed out till the walls are about half an inch in thickness. The height of the vessel is nearly two and a half feet, the diameter of its base eleven inches, and of its outlet seven inches. The wooden churn, after having been in use for about a fortnight, needs to be well washed with hot water, then steamed and thoroughly dried. Some even insist upon its being occasionally smoked, which is unnecessary, however, if strict attention be paid to cleanliness. One decided merit the skin bag certainly possesses,—a quality of great moment to the nomads who have few artificial appliances for regulating the surrounding temperature during the preparation of koumiss; the vessel of hide being somewhat porous, the watery portions of the milk, on soaking through to its outer surface, help, by evaporation, to keep the fluid cool inside.¹

The milk, whatever vessel it is placed in, is beaten up with a wooden stick, two inches in thickness, from four and a half to five feet in length, and made at its lower end either in the manner of a churn-staff, or of a circular plate with holes bored through it. The wooden cylinder is also provided with a tightly

¹ The Bashkirs, however, by smearing the interior of the *saba* with oil, prevent the absorption of milk by the walls of the vessel, but they thereby also arrest evaporation.

The simplest of any is that recommended by Bogoyavlensky and adopted and modified by Tchembulatof. It is prepared thus:¹ Take a quarter of a pound of millet-flour, add water to it, and boil it down to the consistence of thick oatmeal-porridge. Then heat separately, in another vessel, eleven pints of milk to boiling-point, and then allow it to cool down. When its temperature has fallen to 95° Fahr., pour it into a wooden bowl or tub, and add the boiled flour to it. The upper and open part of the vessel is then covered with a piece of coarse linen, and left at rest—at a temperature of about 99° Fahr.—from twenty-four to forty-eight hours. The appearance of small bubbles, which keep bursting on the surface of this liquid, combined with a vinous or acid odour,

¹ I have brought forward Tchembulatof's receipt, which differs from Bogoyavlensky's in the use of a larger quantity of millet-flour, and in the boiling of the latter apart from the milk. Dr Postnikof's plan is the following: Half a pound of millet-flour and a quarter of a pound of malt are mixed with a sufficient quantity of honey to form a paste, which is put into a clean jar, covered with a linen cloth, and placed on a warm stove. The mass soon begins to rise, and is then taken out, wrapped in a piece of muslin, and dropped into a clean earthenware vessel, containing about a quart of new mare's milk, which is placed in the same temperature that the paste was kept in. As soon as signs of fermentation begin to show themselves in the fluid, the paste must be removed, while the milk, after being stirred, should be left in the same temperature till bubbles appear (only in very small quantities) on its surface. The ferment is then ready.

prove that the ferment is ready. To this fermenting fluid twenty-two quarts of new milk are gradually (*i.e.*, every ten minutes) added, and the whole mass is continuously beaten up for twelve hours. The temperature during stirring should never be higher than 94° Fahr. The whole fluid soon begins to ferment, and after twelve hours a not unpleasant koumiss is ready. This should be filtered through a horse-hair or muslin sieve, after which it is fit for drinking. This liquid is called weak koumiss; but a limited portion of the lactine has undergone the lactous and vinous fermentations, and thus the percentage of alcohol is small. Koumiss at an ordinary temperature remains weak for twelve hours after it has been beaten up, and then gradually passes into medium.

Now all the ferments, whether natural or artificial, which have been alluded to above are employed in those cases only where we have to prepare koumiss *de novo*. Our koumiss, once procured, however, we possess in it the best and most handy substance for subjecting fresh portions of milk to fermentation. The nomads, for instance, and the proprietors of the koumiss establishments in the vicinity of Samara, who do not milk their mares during winter, resort, in spring, to the dried casein of strong koumiss, prepared in the autumn of the preceding year. It

is called "dried koumiss yeast," and is made as follows: The casein which in strong koumiss falls to the bottom of the vessel is collected, pressed, and deprived of its moisture by exposure to the sun, and then put into an earthenware jar, and kept in a dry place from autumn till spring. The "koumiss powder or yeast" presents the form of a greyish homogeneous mass, and consists of casein (in a state of fermentation), a small quantity of albumen, and fat. The fat when put aside for so long a period may become rancid, or it may, perhaps, by its presence, and with the aid of the albumen and lacto-protein, induce certain changes in the casein which favour the conversion of a certain portion of the latter into oil, as is observed in the manufacture of Rocquefort cheese, where part of the curd passes into fat. With the view of keeping the butter from putrefying, and perhaps of also rendering the albumen innocuous, Dr Postnikof recommends that the casein, before being dried and pressed, should be well washed with a solution of the purest alcohol and water. Perhaps the removal of the fat by ether may prove beneficial as a preliminary step.

When the koumiss powder is needed for use, it is treated in the following manner: To half a pound of the powder three pints of new mare's milk are

added. The mixture is then well agitated and laid aside in a temperature of from 81° to 90° Fahr. The outlet of the vessel should be covered with a layer of muslin, or plugged with a loose pad of cotton-wadding. After the lapse of five hours, bubbles appear and burst on the surface of the fluid, which in twenty-four hours is decidedly sour, and emits an acid odour. The fermenting liquor is then poured into one of the wooden or skin vessels containing from five to six gallons and upwards of new milk. The mixture is beaten up for twelve hours (the surrounding temperature never being allowed to rise higher than 94° Fahr.), at the expiration of which time the whole of the milk has undergone sufficient fermentation to constitute koumiss.

Once we have procured our koumiss, however, whether by resorting to millet-flour boiled with milk, or to the dried casein, or to sour milk, we invariably afterwards continue to employ koumiss itself as the cleanest, handiest, and most trustworthy of ferments. Of course if we had a simply saccharine fluid to deal with, the ferment, having no nitrogenous principle to feed on, would soon exhaust itself, and we should, every now and again, have to prepare a fresh one; for according to the researches of Payen and Quevenne, when yeast is left in con-

that with a pure solution of sugar it diminishes both in weight and fermenting power, and in the end becomes totally inactive; whereas an increase of yeast takes place when the liquid, in addition to saccharine matter, contains a nitrogenous substance.¹

It has already been pointed out, when artificial fermentation was described, how to procure our first portion of weak koumiss. This koumiss, though not unfit for drinking, is never used as a ferment, but is allowed to pass into medium, and then into strong, koumiss. It is the latter which is employed for the purpose of fermenting fresh portions of milk; and it may be as well, before proceeding further, to point out the difference between weak, medium, and strong koumiss. As soon as milk has undergone sufficient fermentation to become converted into weak koumiss, it continues in that state for about twelve hours when kept at an ordinary temperature, and then passes into medium koumiss. Weak koumiss is as thick as mare's milk, and tastes somewhat like it, only that it is slightly sour, and has a slightly tart flavour from the carbonic dioxide, which it contains in small quantity.²

¹ Mém. des Savants Etrangers, ix. 32. Quevenne, Journal de Pharmac. xxvii. 593.

² There is a great deal of carbonic dioxide formed at the beginning of fermentation—so much, in fact, that it would break any

Medium koumiss, which is the result of from twenty-four to forty-eight hours' fermentation, is thinner than the preceding, not so milky to the taste, contains less free carbonic dioxide, and may be bottled and kept in a cool place for two or three days. Strong koumiss is produced by the assiduous agitation of the milk for upwards of forty-eight hours. It is thinner than medium koumiss, and even watery; contains a greater amount of alcohol and carbonic dioxide, and is much more acid and tart to the palate.¹ It is the only koumiss that can be kept for any length of time without undergoing serious change. When bottled, it divides into three layers, which, in accordance with their respective specific gravities, consist of oily particles above, serum holding the salts in solution in the middle, and casein below. After the lapse of several days, weeks, or even months,—according to the temperature in which the liquid is placed,—the whole of the milk-sugar passes into lactic acid, alcohol, and carbonic dioxide, and fermentation ceases.

champagne-bottle that weak koumiss was placed in. But the liquid itself does not get impregnated with carbonic dioxide so easily. Thus strong koumiss, even when not bottled, contains much more carbonic dioxide than weak; for in the latter, though much gas is formed, it nearly all escapes.

¹ This question will be more fully entered into in the chapter on the "Physical Properties of Koumiss."

Before drinking strong koumiss, the bottle in which it is kept should be well shaken, so that the fat, serum, and casein may be equally distributed through the fluid.

It will be necessary now to inquire how these different kinds of koumiss are prepared, and in what way, during a whole season, a regular supply of each is kept up. The whole secret consists in possessing a sufficient number of *sabas*, and in replacing the koumiss removed therefrom, by a corresponding quantity of new milk.

The process employed at most of the koumiss establishments is the following:—

Into one of two *sabas*, five pints of old koumiss or any other of the ferments already referred to are poured, and eleven quarts of new milk, previously filtered through muslin or a horse-hair sieve, added: this is done late in the evening. The milk, if not taken direct from the mare, should be used within an hour of being cooled down. The mixed fluid is stirred with the churn-staff for about fifteen minutes, and the lid is then fitted on to the vessel, which is allowed to stand over night at a temperature of from 72° to 90° Fahr.¹

¹ Although fermentation commences almost immediately, and is rapid in proportion to the height of the surrounding atmosphere,

Early on the following morning, and during the whole of the succeeding day, as the milking of the mares proceeds, fresh portions of milk, to the extent of twenty-two quarts, are gradually added to the mixed liquid, which is briskly beaten up, not only on each addition, but at short intervals besides. Towards evening our weak koumiss is ready. We pour 9-10ths of it into *saba* No. 2 (which is empty), where it is slightly stirred with about two and a half gallons of new milk, and then left for the night, with the lid over it, at a temperature of from 72° to 90° Fahr. The next day the weak koumiss in No. 2 is frequently and vigorously churned, and towards evening it will already have passed into medium. Into vessel No. 1, however, when deprived of 9-10ths of its koumiss, an equivalent amount of new milk is added, the mixed fluid is beaten up for an hour and left in a warm place for the night. By resorting to energetic agitation next day, our weak koumiss is ready towards evening in No. 1.

As the medium koumiss from No. 2 is withdrawn, weak koumiss from No. 1 is added in its stead, a

it takes at least five hours before it has advanced sufficiently far to impart a decidedly acid taste to the liquid, or to cover the surface of the latter with a thick froth, caused by the bursting of bubbles of carbonic dioxide.

corresponding quantity of new milk being at the same time poured into No. 1. A permanent supply of weak and medium koumiss is thus kept up. With regard to strong koumiss, it is prepared in two different ways,—the one method being employed by the Bashkirs and Khirgiz, the other at the koumiss establishments in the vicinity of Samara. The latter is the simpler plan of the two, and provides a sparkling and more palatable beverage besides. It is the following:—

Medium koumiss is poured into champagne-bottles, well corked, and then exposed to warmth and light. After the lapse of about twelve hours, the liquid having been kept at a temperature of from 72° to 94° Fahr., the medium has passed into strong koumiss, which latter becomes more alcoholic and sourer the longer it remains in bottle. If it be our aim to keep the strong koumiss from undergoing further change, the bottles are placed on ice, and then fermentation becomes so slow that it may be regarded as having nearly ceased. The Khirgiz and Bashkirs, on the other hand, who are extremely fond of strong koumiss, although they generally drink the medium, insure a regular supply of the former for daily consumption in the following manner: They have three *sabas* in use; No. 1, containing weak koumiss,

and No. 2, medium—both prepared in the way just referred to. Every evening three-fourths of the medium koumiss which is ready in *saba* No. 2, is poured into the empty *saba*, No. 3. A quantity of new milk, equal to one-half of what had been removed, is then placed into No. 2, slightly stirred, and left over night. During the whole of the next day, while fresh portions of milk are being added to *saba* No. 2 (until it contains a quantity equal to that of the preceding day), the liquid is briskly beaten up. Agitation is also applied to koumiss in *sabas* No. 1 and No. 3, with the result, that towards evening No. 3 holds strong koumiss, No. 1 medium, and No. 2 (in which there was medium koumiss the previous day) weak. Thus vessel No. 3 will contain three-days-old koumiss, No. 2 one-day-old koumiss, and No. 1 two-days-old koumiss. As the strong koumiss is removed from No. 3 for consumption, it is at once replaced by a corresponding amount of new milk.

The succeeding day No. 1 will thus contain strong koumiss, No. 2 medium, and No. 3 weak. A very important point to be attended to in the preparation of koumiss, is that the temperature should be equable. It is as necessary that it should not be allowed to fall too low, as that it should be prevented

KOUMISS.

... too high. Nothing has so powerful an influence on the quality of koumiss as rapid change of temperature. Thus in the best koumiss, if the heat of the surrounding atmosphere rises above 50° Fahr., and no measures are taken to keep the vessel in which it is prepared cool from without, the lactic fermentation progresses more rapidly than the alcoholic, and the fermented fluid becomes acid to a degree that few stomachs can support. Further, if the heat be very high, and the stirring lazily executed, there is even danger of butyrous fermentation being set up.

Too low a temperature, again, or its too sudden fall, acts just as fatally. Thus it frequently happens that koumiss—in the preparation of which the most assiduous care has been taken—during a sudden change in the weather from hot to cold, or when exposed to the low temperature of the air during a chilly night, deteriorates greatly in quality. To avoid the latter of these two accidents—*i.e.*, not to allow the temperature of the fermenting fluid to fall too low—the natives either place the *saba* in a tent where there is considerable heat (a fire being frequently raised for the purpose), or else they envelop it in thick felt or fur. At the koumiss establishments where wooden vessels are employed, heated bricks

are placed under them, if the temperature of the koumiss dairy happens to be too low.

Excessive heat is guarded against by surrounding the *saba* with wetted grass, the water of which on evaporation cools the leathern vessel. The latter, moreover, when not impregnated with oil, assists, by the porosity of its walls, in cooling the fluid contents.

When a wooden churn is used, it is placed on ice to counteract the influence of the surrounding atmosphere when too warm. The Bashkirs generally add about one-third of cold water to the koumiss, and thus attain the double object of cooling the latter, and of retarding the lactous fermentation, which is active in proportion to the state of concentration of the fermenting fluid.

Hence it follows that the nomads, who have neither ice-cellars nor ice to cool the fermenting milk when necessary, are much more dependent for the qualities of their koumiss upon the state of the surrounding atmosphere than are the proprietors of the koumiss establishments, where there are properly constructed dairies, in which the air may be rapidly raised to the desired degree by stoves¹ or reduced

¹ The Khirgiz in cold weather frequently kindle a fire inside their *kibitka*, which is a tent constructed of thick felt, and prepare their koumiss therein.

by ice, and where, by a properly arranged system of ventilation, the atmosphere is kept pure.

In the preparation of koumiss, the following facts in chemistry should be kept in mind :—

1st, That alcoholic fermentation may be conducted at a temperature as low even as 40° Fahr.

2d, That at a temperature above 94° Fahr., alcoholic fermentation ceases, and lactic degenerates into butyric.

3d, That too sudden a fall or rise of temperature should be carefully guarded against.

4th, That the milk should be energetically agitated when agitation is indicated.

CHAPTER VI.

THE PHYSICAL PROPERTIES AND THE PHYSIOLOGICAL
ACTION OF KOUMISS.

THE physical properties of koumiss will vary considerably according to the length of time during, and the temperature at, which the milk has been subjected to fermentation, and according to whether it has been kept in a tightly closed bottle or in a vessel where there has been no obstruction to the escape of carbonic dioxide. Thus weak koumiss—*i.e.*, of twenty-four hours' fermentation—has more of a milky and sweet, and less of an acid taste; while strong koumiss, which has been fermenting at least three days, is sourer, has no milky or sweet taste, and is, if well corked in bottle, more sparkling. Indeed, strong koumiss contains so much carbonic dioxide, that it sometimes bursts champagne-bottles and fills three-quarters of the glass into which it is poured with froth.

A description of the physical properties of medium

koumiss, the drink commonly used by the nomads, will convey the best idea of fermentation in mare's milk in general.

Koumiss is a thin, homogeneous, white fluid, which differs in appearance from mare's milk by small bubbles, like those seen in soda-water after it has stood a while, bursting on its surface,—their number being greatly increased on agitating the fluid. It has a pleasant, sweetish, acid taste—the latter decidedly predominating—and leaves on the tongue a curdy or rather creamy flavour. It reminds one somewhat of butter-milk, only that it is more tart, while the creamy after-taste is not so decidedly pronounced.

Rubruquis describes the pungency of what was likely strong koumiss; for the nomads probably then placed, as they still place, the oldest koumiss, just as Europeans do their oldest wine, before a favoured guest.

Marco Polo says: "Their drink is mare's milk prepared in such a way that you would take it for white wine—and a right good drink it is, called by them *kemiz*." Its acidity is light and pleasant to the palate, producing no irritation of the mucous membrane of the mouth or fauces. At an ordinary temperature it has a sourish, raw smell, and emits the specific odour of the mare, mingled with, and

sometimes even masked by, the pleasant aroma of the steppe grasses, to which the animal has had access in feeding. When the mares are cleanly kept, however—*i.e.*, bathed every day, and their udders washed and dried before and after milking—an exceptional occurrence in the steppes,—the specific smell is but faint, or entirely absent. If prepared in a newly smoked and greased *saba*, the koumiss has a slightly smoky and oily taste and odour.

As compared with medium, the strong koumiss is thinner, sourer, and more sparkling, and has no sweetness whatsoever; while weak koumiss is thicker, sweeter, less sour, and more creamy to the palate. Weak koumiss, when left at rest for several hours in a cool place, remains homogeneous—none of its component parts rising to the top and none falling to the bottom of the liquid; while in medium koumiss, and more particularly in strong, a sediment consisting of thin flakes of casein is formed. Occasionally small round fatty bodies float to the surface of the koumiss—the butter, in fact, produced by churning—which the Bashkirs call *mye*.

When mare's milk has not undergone a sufficient degree of fermentation to be converted into koumiss, it invariably, like all improperly fermented liquors, disagrees with the stomach, and hence it is im-

portant to know by what properties immature koumiss may be recognised and its employment guarded against.

"Fermented mare's milk," writes Dr Bogoyavlensky, "which presents the qualities of weak koumiss, but in a mild degree, and which, moreover, when swallowed, leaves a decidedly milky taste in the mouth, and has a strong milky, but faint acid smell, will, if poured into a cup and allowed to stand, have small filaments, whiter and thicker than the rest of the liquid, rising to its surface, these filaments being nothing more than insufficiently fermented milk. The koumiss is then called 'young,' or 'unripe.'"

In considering the physiological action of koumiss, it should be borne in mind that, as it is a drink which varies greatly in strength—i.e., in the quantity of alcohol, lactic acid, and carbonic dioxide it contains—its effects upon the system will be more or less marked according to the extent to which fermentation has proceeded in the milk. It will best suit our purpose to inquire into the physiological action of koumiss of the strength generally drunk by the nomads, forming by far the most important part of their dietary during seven months in the year; although it will also be necessary further on to refer

to the effects on the system of the three different kinds of koumiss—the weak, medium, and strong—into which, for therapeutical purposes, fermented mare's milk is artificially divided.

When medium koumiss of the ordinary room temperature is taken in doses of from two to eight glasses (counting three glasses to the champagne-bottle), a sensation of coolness and fulness is experienced at the pit of the stomach, but is soon succeeded by a more than corresponding degree of warmth. The feeling of coziness quickly spreads over the whole body, while easy, mildly acid eructations successfully relieve the slight weight and tension at the gastric region. The cardiac pulsations increase in frequency and volume, slight palpitation being occasionally experienced. An indisposition for bodily or mental work, and a strong inclination towards the *dolce far niente*, insidiously creep over the patient. If the koumiss is strong, and the drinker unaccustomed to the use of stimulants, slight intoxication is produced, the alcohol manifesting its calming and sedative, rather than its stimulating or excitant, effect on the nervous system. The mildly tipsy individual is neither boisterous, quarrelsome, nor even argumentative, but prefers to be left alone, when he either lies in

a dozing state, or falls into a deep, prolonged, and refreshing sleep. There is never any headache on awaking, however large the quantity, and whatever the strength, of the koumiss consumed. The sensation of hunger, though considerably blunted, is not removed by koumiss. "While quieting hunger," observes Dahl, "koumiss does not suppress it. In drinking fermented mare's milk one can eat a great deal, but one can also do without food."

It never overloads or lies heavily on the stomach, and can be taken at any time and in any quantity without exciting oppression at the gastric region. The activity of the kidneys and skin, particularly of the former, is greatly increased,—diuresis, according to Zeeland, being in excess in cold—diaphoresis, in hot weather. There is a frequent desire to micturate,—more frequent than from the consumption of the same amount of water, tea, or coffee.

The effect of koumiss upon the alvine secretions is constipating in proportion to its strength and age; weak koumiss, when taken in large quantities, being occasionally even purgative.

There is also hyperæmia and increased activity of the sexual organs, which in men is more marked at the commencement of treatment. With women the catamenia appears before its time, lasts longer, and is

much more abundant. With some patients the night rest is greatly disturbed at the beginning of the cure ; but this soon wears off, and the sleep becomes profound and refreshing.

“ Another symptom, which is occasionally present,” writes Polubensky, “ and which accompanies and at times increases the insomnia, is itching of the skin. It sometimes occurs as a symptom, preceding or following the sleeplessness. The itching is particularly felt in bed, and commences with the back of the hands and the soles of the feet ; one has only to yield to the temptation and scratch the parts and the pruritus spreads further and further. This disagreeable symptom is aggravated by the use of baths, but yields to morphia,—a proof of its nervous nature. The itching passes away towards the end of the second week of the koumiss cure, while occasionally it ends in an eruption, resembling urticaria, on the back of the hands, the nape of the neck, and the soles of the feet.”

When taken strong and in large doses, and by weak individuals, koumiss sometimes produces headache, which increases towards night. After a while this feeling also wears off.

Dr Postnikof, who ascribes to koumiss the production of a catarrhal state of the mucous membranes

in general, states that the first action of fermented mare's milk may be observed in the conjunctivæ, which become congested, and occasionally even granular, their secretion being increased in amount, and troublesome to the patient.¹

Such are the subjective symptoms produced by moderate or large doses of koumiss. The purely objective signs consist in a striking improvement in the colour of the skin, which loses its pasty look, and becomes pinker and healthier in appearance—the pale cheeks even assuming a rosy tint—and in a remarkable increase in the weight of the body, and a rounding off of previously existing angularities.

This is due partly to hypertrophy of the muscles, chiefly, however, to the deposit of fat in the sub-cutaneous cellular tissue. The rapid improvement produced by koumiss in the outward appearance of persons whose diet has been spare, is striking in the extreme.

The best examples, and the largest in point of number, of this phenomena, are to be observed among the nomads in early spring, after they have changed their winter diet of dried salt-meat for one of koumiss. "The Bashkir Tartars," observes Grieve, "who, towards the end of the winter are much emaciated,

¹ *Op. cit.*, p. 60.

no sooner return in summer to the use of koumiss than they become strong and fat.”¹

“The faces of the nomads,” writes Dahl, “which during winter become emaciated, and present a more than usual prominence of the cheek-bones, undergo so great a change, and turn so plump the first few weeks of spring, that you are unable to recognise your acquaintances.”²

It will now be necessary to inquire more fully into the physiological action of koumiss, an inquiry which will be considerably simplified by our bearing the component parts of fermented mare's milk in mind. The fermented fluid which, as koumiss, is conveyed into the stomach, while containing all the component parts of fresh milk, has lactic acid, alcohol, and carbonic dioxide entering into its composition besides. These latter play an important part in the physiological action of koumiss. It will be necessary, therefore, to trace their effects on the digestive track, the heart and circulation, the nervous system, the kidneys, skin, bronchial tubes, sexual organs, and mucous membranes in general, as well as the muscular and adipose tissues.

¹ *Op. cit.*, p. 187.

² Журналъ Министерства Внутреннихъ Дѣлъ. 1843.—
Томъ I.—Нѣчто о Кумисѣ. (Journal of the Ministry of the
Interior, 1873. Book I. “On Koumeez.” By B Dahl.)

Let us first consider the action of koumiss upon the stomach. We have already seen that the sensation of coolness is felt almost immediately after koumiss is swallowed, though even in small quantity, and of an ordinary temperature. The sensation of coolness is due partly to the carbonic dioxide, but chiefly to the lactic acid, both of which cause contraction of the capillaries of the gastric mucous membrane. The reaction soon follows, however. Not only that the contracted capillaries recover themselves, but the alcohol contained in the koumiss stimulates them, and produces an increased flow of blood to the coats of the stomach, which accounts for the feeling of warmth rapidly succeeding that of coolness. The successive flow of gastric juice which follows stimulation of the mucous membrane of the stomach by the alcohol contained in koumiss, is furthered by the action of carbonic dioxide, which also acts as an excitant. Like most acids, it assuages thirst, imparts a sensation of coolness to the skin, and promotes secretion in the whole of the alimentary tube. It accelerates the pulse, moreover, refreshes and exhilarates slightly, allays irritation of the stomach, and partly removes the feeling of repugnance with which individuals enfeebled by disease regard even the very idea of food. The excess of carbonic

dioxide passes on to the small and large intestines, producing its slightly stimulating action there, and a certain and probably very limited quantity is absorbed by the capillaries and enters the general circulation. The most important body, however, produced by the fermentation of milk, and the one which exercises the greatest influence on digestion, is the lactic acid.

Indeed, since the bitter and long-continued controversy between physiological chemists as to whether the acidity of the gastric juice is due to hydrochloric or to lactic acid, and which of these two plays the most important part in digestion, has been set at rest by proofs having been adduced that both contending sides were partly in the right, lactic acid has had a more important place assigned to it in digestion than it ever occupied before.

The vexed question has been settled by the analysis of Richet,¹ who was able to procure gastric juice in its pure state through a fistulous opening in the stomach of a patient, upon whom gastrotomy had been successfully performed for impassable stricture of the œsophagus. He conclusively proved that the acidity of the gastric secretion is due almost entirely to a mineral acid, and that that mineral acid is muriatic, with a very small amount, about four per

¹ Du Suc Gastrique, par Ch. Richet. Paris: 1878.

cent, of an organic acid (the sarcolactic, probably). The muriatic acid is not free, but in loose combination with leucine. When food is introduced into the stomach, the hydrochloric acid of the gastric juice unites with the bases of the acetates, phosphates, butyrates, and particularly the lactates, which it encounters, and sets their acids free. The most important of the organic acids thus separated from its base by muriatic acid, is the lactic, which is almost invariably detected during the digestion of food, and in such quantities, that it has been, and is, rightly considered the acid of chyme.

Daily experience proves how important a part lactic acid plays in the digestion of protein compounds, and what large quantities of these may be assimilated when a sufficient amount of the former is introduced with the food. Thus butter-milk can be consumed almost by the gallon as an article of diet, whereas the stomach would soon revolt at the employment, for any considerable period, of much smaller doses of sweet milk. And this—though partly owing to the butter-milk being less rich—must be ascribed chiefly to the conversion of a considerable portion of the lactine into lactic acid. A recent writer in 'Blackwood's Magazine,'¹ who had travelled

¹ The Abode of Snow, by Andrew Wilson.

much in the Himalayas, and was for weeks confined to a diet of milk, states that the only way of overcoming large quantities, is to take it in the shape of sour milk—i.e., with a large amount of the lactine converted into lactic acid.

Professor A. Schmidt of Dorpat has further shown that a decided difference exists in the physical properties of casein coagulated by rennet, and in that coagulated through the natural souring of milk. "The casein precipitated by the spontaneous souring of milk," writes Professor Schmidt, "had the appearance, when washed with water, of thin flakes, which sank slowly to the bottom of the fluid; whereas the casein coagulated by rennet formed large clots of an elastic consistence, which fell quickly to the bottom of the fluid, and which it was possible to divide finely in water only after the addition of caustic soda or acetic acid at the commencement of the solution of the casein."¹

These highly important experiments of Professor A. Schmidt conclusively prove why fresh milk, when taken in large quantities, is digested with extreme difficulty; whereas, when the casein is first precipitated by lactic acid—whether produced by sponta-

¹ Ein Beitrag zur Kenntniss der Milch, von Prof. Alex. Schmidt. Dorpat: 1878.

neous coagulation of the milk, or as the result of more rapid artificial souring—milk becomes the most digestible of foods. The gastric juice, in fact, is simply relieved of part of its work, which work is performed for it in a more efficacious manner outside the body by lactic acid. For it has also been proved by Richet, that the amount of acid in the stomach during digestion is always about the same, so that the more acid the food contains, the less gastric juice will be poured out, or at any rate, the less acid will the juice contain.

It is not only that the work the stomach has to perform is lightened by part of the lactine being converted into lactic acid outside the body, but a portion of the casein of koumiss, as we have already seen, is absorbed by the whey during fermentation, and is thus more easily reached and acted upon by the gastric juice than those parts, however fine their state of division, which are suspended in the solution. Koumiss is quickly digested by the stomach and intestines, and so completely is the greater part of it absorbed, that the fæces become extremely scanty, light-coloured, and almost odourless.

The constipating effect of koumiss, therefore, should rather be ascribed to the very perfect assimilation of all the particles of fermented milk, which leaves

little—and that little in a very concentrated form—for the intestines to expel, than to the production of an atonic state of the rectum. It is true that diarrhoea, to the extent of from three to five thin, painless stools per day, frequently accompanies the employment of weak koumiss, particularly at the commencement of the treatment; but this is due to excess of zeal on the part of patients, who consume larger quantities than the stomach is able to digest, and also because weak koumiss is not as perfectly, or rather completely, fermented a beverage as strong koumiss. Strong koumiss, which contains more alcohol and lactic acid than weak, and is not so liable to be abused, since it cannot be drunk in as great doses, produces constipation from the very beginning. The fæces are often passed in the shape of hard, odourless, white scybalæ, and cause considerable pain.

Those who are subject to heartburn, although they may suffer from it slightly at first, particularly when placed upon strong koumiss, soon get rid of the unpleasant symptom. The appetite improves, moreover, under the influence of koumiss; and this is the natural consequence of the carbonic dioxide stimulating the coats of the stomach, of the lactic acid relieving the gastric juice of a part of its work, and lastly, and

chiefly, of the alcohol increasing the secretion of the gastric juice and the movements of the stomach. For the alcohol present in fermented mare's milk is perfectly pure, well diluted, and—admitting the daily consumption of enormous quantities of strong koumiss—in doses not in excess of what the system, according even to the modest computation of Professor Parkes,¹ is well able to endure. And this brings us to the consideration of the physiological action of koumiss, or rather of its alcohol upon the heart and circulation.

The action of koumiss upon the pulse and circulation may be divided into the immediate and remote. The immediate action, which consists in increasing the force and frequency of the cardiac pulsations, must be ascribed to the alcohol which it contains; for the stronger the koumiss, and the larger the dose consumed, the more manifest is this effect upon the circulation. Thus Dr Polubensky found that in his own case, and in several others, koumiss at first increased the pulse-rate from fifteen to twenty beats per minute, and that during the whole time the treatment was continued, the frequency of the pulse was ten above the normal. From the very commencement,

¹ "On some Points in the Dietetic Treatment of Disease." *Lancet*, May 1874.

moreover, it became harder and fuller, remaining so throughout. In experimenting upon myself, and upon several nomads in rude health, I rarely observed the pulse to rise more than ten beats in the minute,—a rise of five being the average,—while at times it remained stationary. In fulness, however, it was always increased. In all these cases the pulse, after a while, sank to its normal condition, although it was followed by no retardation, as in Dogiel's experiments with alcohol.¹ The respiration was slightly increased in some cases, unaffected in others. With the feeling of warmth spreading through the body, the face became considerably flushed. The manifestation of these symptoms is greatly dependent upon the strength of the patient and of the koumiss he consumes.

Such is the immediate action of koumiss upon the circulatory system. In its remote action it strengthens the muscular fibres of the heart (by supplying the latter with healthy blood); and by causing a dilatation of the capillaries, it brings colour to the skin, and to those parts of it in particular which are exposed to the action of the air. There can be no doubt, also, that the improved condition of the circulating fluid, and exposure during the whole

¹ Pflüger's Archiv, vol. iv. parts 11 and 12.

day to the stimulating air of the steppes, help considerably to throw increased colour into the koumiss-drinker's cheeks; but still the chief and most important factor is the alcohol, which, while lessening the resistance of the capillaries, increases the force of the cardiac contractions. "With repeated quantities of alcohol, not excessive in amount," writes Professor Fraser,¹ "the dilatation of some of the vessels (superficial) becomes permanent. The frequent repetition of the dose prevents an opportunity being given them to contract."

With regard to the physiological action of koumiss on the temperature, the experiments made by Dr Boykof on a friend in perfect health, tend to confirm the observations of Lussanna and Albertoni,² who, from numerous trials on healthy men, came to the conclusion that alcohol in a physiological dose does not produce a constant modification of the heat-making process. Indeed, the fall of temperature, if fall there be, is quite insignificant, and when small quantities of weak koumiss are taken, almost *nil*. Dr Boykof, however, who is no friend of mare's milk, never having watched its therapeutic action, and

¹ Alcohol: its Functions and Place. By Thomas R. Fraser. P. 13. Edinburgh: 1880.

² Giornale Veneto delle Scienze Mediche, Mart. 1875.

having produced his physiological experiments upon but one individual, affirms that "koumiss has one great advantage over cow's milk—viz., that when taken in large doses it does not increase the temperature of the body."¹ The slight difference that exists in the evening temperature of those who consume milk in its plain and in its fermented state, must certainly be ascribed to the alcohol contained in the latter.

The inebriating action of koumiss, and its calmative effect upon the nervous system of many individuals, had been noticed by the earliest travellers (who were also struck by the fact that such remarkable results could be produced by fermented milk),

¹ The facts which Dr Boykof brings in support of his statement say little in his favour. Thus it is in the rise of the evening temperature that Dr Boykof seems to perceive a confirmation of his views, and it is just by applying this very test that his assertion may be proved to be remarkably exaggerated. Thus, during the employment of koumiss for sixteen days (six bottles per diem), the evening temperature rose 0.28° C.—i. e., about three-tenths of a degree; during thirteen days' milk diet (from two and a half to five bottles), the average rise of the evening temperature was 0.34°, or a difference of less than one-tenth of a degree between the evening temperature during a koumiss and a milk diet. When an ordinary diet was adhered to, the evening temperature rose 0.26°—i. e., also less than one-tenth of a degree as compared with the milk diet. When five and a half bottles of milk were consumed for several days in succession, the evening temperature rose 0.44°, thus constituting a difference between it and the rise from koumiss of 0.16°, and not from 0.3° to 0.4° as Dr Boykof asserts.

while the absence of any disagreeable after-effects on the head has arrested the attention of most modern observers. Thus, while Rubruquis says that it "intoxicateth weak brains," Gmelin, referring to the spirit which the Tartars and Kalmucks distil from mare's milk, says, "They chiefly praise the spirit of milk, which, while inebriating them, produces no headache."¹

Oseretkowsky, who, towards the end of the last century, accompanied Lepechin and other Academicians in their travels through Siberia and the steppes, states regarding the effects of spirit obtained from milk: "At all events I have seen many Tartars who by the employment of fermented spirit in large quantities drove away a headache by the intoxication it produced. Moreover, I can assert that few of the Tartars distil a spirit from their koumiss (which, however, they delight in), but that they all drink fermented milk during the whole of the summer, which not only causes no headache, and not only makes them feel well, but often hilarious."²

Grieve asserts that the patients whom he had sent

¹ Reise durch Sibirien, tom. i. p. 273.

² "Arki vel draki appellatur a Tartaris atque Kalmuccis Spiritus Vinosus quem illi ex lacte equino vel bubulo destillant."—De Spiritu ardente ex Lacte Bubulo, Nicolaus Oseretkowsky. Petropolitani: 1778.

to the steppes informed him, on their return, with regard to koumiss, "that even in cases of excess it [koumiss] was not followed by indigestion, headache, or any of the symptoms which usually attend the abuse of other fermented liquors."¹

"It is impossible to get drunk upon koumiss," writes Dahl, "although it occasionally causes slight intoxication. High spirits, a flushed face, and then tranquil sleep, with which all symptoms terminate. There is never any headache."²

"Generally," writes Bogoyavlensky, "during the koumiss cure the sleep is prolonged and quiet, the body is covered by a slight perspiration, and one awakes from slumber easily and with a clear head."³

Dr Polubensky states that the small doses of koumiss taken at the commencement of the treatment produce "slight stimulation, the manifestations of which are observed in a cheerful, reckless, 'devil-may-care,' and contented spirit. The larger doses taken subsequently occasion a mild intoxication, which shows itself in a feeling of laziness and *insouciance*. Ideas and speech seem fettered, and there is no wish either to think or talk. On increasing the dose, everything which acts as an excitant to the mind seems to be forgotten, and yawning and a

¹ *Op. cit.*, p. 187.

² *Op. cit.*, p. 14.

³ *Op. cit.*

desire for sleep supervene. But however great the quantity of koumiss consumed, I have never observed complete inebriety resembling that produced by ardent spirits. One woman, quite unaccustomed to the use of stimulants, never appeared tipsy, although she consumed fifteen bottles of koumiss daily.”¹

Now the action of koumiss upon the brain and nervous system is due not only to the alcohol which it contains, but also to the carbonic dioxide and lactic acid. Hence its stimulating and intoxicating effects must be ascribed to alcohol strengthened by carbonic dioxide; its hypnotic action to the alcohol and lactic acid; while the remarkable fact that no bad effects, such as indigestion and headache, for example, follow its administration, even in large doses, is most probably owing to its spirit being pure ethylic alcohol. The stimulating action of the alcohol of koumiss upon the brain and nervous system, is beyond doubt accelerated and rendered more active by the presence of carbonic dioxide, a small part of which is absorbed by the capillaries of the stomach into the circulation.² Of the more energetic

¹ *Op. cit.*, November 1865.

² The amount of carbonic dioxide which enters the blood and is carried to the brain and other distant organs, need never cause alarm whatever the quantity of koumiss, or of any other effervescent drink, consumed. Dr Althaus, however, regards the subject

and rapid action of alcohol when taken with carbonic dioxide there are many familiar examples. The hilarity produced by champagne, for instance, and the fact that its intoxicating property is not proportionate to the percentage of spirit it contains, must be ascribed largely to carbonic dioxide. The same thing is observed with brandy and whisky drinkers, who, when they take their spirits diluted with soda or seltzer water, or any other effervescing drink, in a more serious light, and states that, "if the gas is not quickly eliminated, but accumulates in the blood, it may produce asphyxia. This is sometimes caused by taking large quantities of white wine, in which fermentation is going on."

He further quotes Liebig, who is of opinion that, "if such wine is ingested, the fermentation is augmented by the heat of the stomach. The carbonic dioxide is evolved, penetrates through the walls of the stomach and the diaphragm, to the cells of the lungs, and there displaces oxygen; death then ensues with symptoms of suffocation from an irrespirable gas" p. (192).—*The Spas of Europe*, by Julius Althaus, M.D.

I am unable to judge from personal experience what the effects of drinking a gallon or two of seltzer or soda water may be, but surely the danger of asphyxia is exaggerated. I have, however, seen three persons consume thirteen bottles of champagne at a sitting, without observing the terrible toxic effects, which, according to Liebig, should in these cases have been well marked. Dr Stahlberg deals with the subject in a still more curious manner. His estimation of the action of the carbonic dioxide of koumiss on the nervous system is founded on Cyon's, Traube's, and Thiery's experiments with the frog's heart after its removal from the animal's body! Whatever the effects of carbonic dioxide when pumped into the empty heart of the frog, its action, when taken in large quantities in effervescing fluids into the human stomach, is not followed by any appreciable danger to the nervous system, nor to the centre of circulation.

get tipsy much more rapidly than when they swallow the same amount of alcohol dissolved in common water.

The hypnotic action of koumiss, while due chiefly to the alcohol, is partly the result of the lactic acid it contains. Thus, according to the experiments of Dr Preyer,¹ lactic acid acts as a powerful soporific. The respiration during sleep, according to his experiments, became slower, the bodily temperature fell, and the reflex activity was lessened. Now, although the accuracy of Preyer's observations has been questioned by Dr E. Mendell,² Dr Erler,³ Dr Fisher,⁴ Dr Lothar,⁵ Dr Senator,⁶ yet even they admit that lactic acid and its salts tend to produce sleep, although the hypnotic action is feeble.

We now pass on to the consideration of the action of koumiss on the kidneys and skin. Rubruquis pointed out that koumiss "causeth urine to be voided in great quantity;" and every observer since his time, with the exception of Ucke,⁷ who denies its

¹ Centralblatt Medicin. (Wissens, 1875), p. 578.

² Deutch. Medicin. (Wochen, 1876), p. 17.

³ Centralblatt Medicin. (Wissens, 1875), p. 658.

⁴ London Med. Record, 1877, p. 193.

⁵ Virchow's Archiv., B. 66, p. 120.

⁶ Berlin. Klin. (Wochen, 1877), p. 537.

⁷ Das Klima und die Krankheiten der Stadt Samara. Berlin: 1863.

diuretic properties, and Stahlberg,¹ who ignores its diaphoretic action, has regarded it both as a diuretic and diaphoretic. Homenko² goes even the length of inquiring "whether any further action can be ascribed to koumiss than a simply diaphoretic and diuretic one." More extended observations in regard to the quantity and quality of the urine voided by persons placed on a koumiss diet, have been made by Polubensky,³ Biel,⁴ and Boykof.⁵ Polubensky experimented upon himself in the steppes, where he had not the appliances at hand for instituting a minute chemical analysis of the constituents of his urine. He has, however, placed the following interesting facts on record with regard to the amount of solids in, and the specific gravity of, the urine, before and during the koumiss cure.

¹ *Op. cit.*

² (On the Curative Action of Koumiss in certain Diseases. St Petersburg: 1842.) Russian, p. 10.

³ Военно-Медицинскій Журналъ.—Полбрь 1865 г.
(Military Medical Journal, November 1865.)

⁴ *Op. cit.*

⁵ Матеріалы къ вопросу о фізіологическомъ дѣйствіи кумыса. Диссертация А. Байкова. Москва 1876.

(On the Physiological Action of Koumiss; a Graduation Thesis. By A. Boykof. Moscow: 1876.) I exclude Dr V. Jagielski's pamphlet, "published by the author's special permission," under the taking title of 'The Effects of Koumiss upon the Urine in Health and Disease' (London), as, although the latest in regard to date, it contains absolutely nothing new, and is simply founded on Dr Biel's (whose name is all along misspelt by Dr Jagielski) and Polubensky's experiments.

"During the ordinary conditions of life," writes Dr Polubensky, "the urine passed by me in the twenty-four hours averaged 1500 cc., of a specific gravity of 1019. I used generally to drink 8 lb.¹ of fluid during the day. Thus, while living as I usually do, I passed, according to the formula of Professor Trapp of St Petersburg, 57 grammes of solids in the twenty-four hours. On increasing the consumption of tea, water, and beer to 15 lb., and even 20 lb. per diem—*i. e.*, a quantity equal to the largest doses of koumiss I was ever able to swallow—the amount of urine increased to 2200, and even 2400 cc.; but for that its specific gravity fell to 1013. Consequently, in spite of the increased flow of urine, the quantity of solids voided remained the same, never exceeding the normal amount by more than four grammes. On employing koumiss to the same extent—*i. e.*, from 15 lb. to 20 lb. per diem—all other fluids being excluded, the amount of urine voided was identical,—sometimes 300 cc. less than during the consumption of the above-named drinks,—but the specific gravity did not fall in proportion. It was rarely lower, sometimes even higher, than the specific gravity of my urine under ordinary circumstances (1019). Hence the average

¹ Russian pound equal to $\frac{1}{16}$ ths avoirdupois.

of solids in the urine during the koumiss cure was, according to the above-named formula, 87 grammes. Which constituents of the urine were in excess, I was unable to determine, but the conclusions I have arrived at are the following:—

“Koumiss acts as a diuretic in the same way that water or tea does; but the amount of solids in the urine during the consumption of an excess of water remained the same as under ordinary circumstances, (occasionally slightly in excess), whereas when the largest quantities of koumiss were drunk, the solids increased 50 per cent, and even more. A high temperature of the surrounding atmosphere had a greater influence in lessening the amount of urine when koumiss than when water was taken.”

The more complete experiments of Biel were made upon a phthisical patient before, during, and after treatment with koumiss. Before the cure, the urine was examined for five consecutive days, and besides presenting the usual appearance of feverish urine, it was strongly acid. After the treatment by koumiss had been continued for several days, the urine which the patient passed during the night always presented an acid reaction, however slight. During the day, while koumiss was drunk, the urine became neutral. Biel found that in this case the use of koumiss in-

fluenced the composition of the urine, and essentially altered the metamorphosis of the tissues. Firstly, there was the peculiar circumstance to notice, that the previously strongly acid urine, by the daily employment of 3500 cc. of koumiss and as limited an amount as possible of other food, became neutral, whereas the urine passed at night showed a slightly acid reaction. "This conduct of a fluid," writes Biel, "which, as our analysis has shown, contains 0.8 per cent of free lactic acid, the patient thus swallowing from two to four grammes of lactic acid daily, certainly seems startling at first sight. It is thus accounted for, however: the lactic acid by oxidation within the body completely passes into carbonic dioxide and water. Moreover, the reaction of normal urine is dependent exclusively upon its inorganic ingredients, so that the presence or absence of lactic acid could have had no influence on its reaction. The fixed salts of koumiss should rather be considered as the undoubted cause. An analysis of the ash of koumiss, as well as of the almost alkaline mare's milk, proved that these fixed salts were throughout alkaline. There was therefore so much alkali introduced into the body that the normally acid constitution of the urine was thereby completely neutralised."¹ The same patient,

¹ *Op. cit.*, p. 45.

placed under similar circumstances, had cow's milk given him instead of koumiss. He was able to stand it for two days only, the urine being acid all the time. The amount of urea voided, which before the treatment with koumiss was only 24.59 grammes daily, successively rose each week to, on an average, 29.17, 27.77, 33.14, 33.76, 33.75, 36.89, 40.79—and sank, after the cure, to 30.38 grammes per diem.

The Uric Acid.

Before the treatment, the average quantity daily voided was 0.6733 of a gramme; during preliminary treatment, 0.4977 of a gramme.

During the 1st week of treatment,	.	.	.	0.3653
„ 2d „ „	.	.	.	0.3756
„ 3d „ „	.	.	.	0.3113

of a gramme.

Up to the third week, therefore, a constant and progressive diminution of the excretion was observed. The next week the amount increased without any apparent cause, till it reached, on the

4th week of treatment,	.	.	.	0.50
5th „ „	.	.	.	0.39
6th „ „	.	.	.	0.78

of a gramme.

During three days after the treatment was dis-

continued, the amount of uric acid increased to, on an average, 0.61 of a gramme per day.

The proportion of uric acid to urea was, before treatment, as 1 to 36; during treatment (taking the average of a week), the

1st week, as	1 to 58
2d „	1 „ 76
3d „	1 „ 95
4th „	1 „ 108
5th „	1 „ 66
6th „	1 „ 92
7th „	1 „ 83
After treatment, as	1 „ 49

The amount of phosphoric anhydride discharged rose progressively from 1.905 grammes in the twenty-four hours, to 2.707 grammes towards the end of the cure.

The quantity of sulphuric anhydride increased from 0.851 to 2.104 grammes.

The weight of the patient increased from 53.99 kilogrammes to 55.238. He began the cure with one bottle, which he soon increased to eight bottles per day. When taking two and a half bottles per day, the urine became alkaline, and remained so to the end of the cure.

Dr Boykof's observations with regard to the physiological action of koumiss on the urine are still more interesting, as they were made upon an individual

in perfect health, and every precaution was taken to regulate his diet, exercise, &c., during treatment. Dr Boykof found that the quantity of urine increased greatly as soon as the koumiss diet was commenced. The acidity of the urine gradually decreased until it fell to one-third the normal amount. With an increase of the urine there was also a rise in the quantity of the urea it contained.¹ During four days of koumiss diet the average of uric acid voided in the twenty-seven hours was 0.247; on an ordinary diet the average was 0.659 of a gramme. The phosphoric anhydride remained the same during, as it was before, the koumiss treatment.

The amount of sodic chloride during two experiments of six days each decreased progressively. The weight increased as follows: in the first experiment, which lasted six days, with a consumption of five and a half bottles of koumiss daily, the patient gained 535 grammes; in the second experiment (four days, and six and a half bottles daily), 1065 grammes; in the third (six days, and six bottles daily), 685 grammes.² It will be perceived that the foregoing experiments of Polubensky, Biel, and

¹ The use of a purely milk diet, however, shows a still greater increase of urea in Dr Boykof's experiments.

² *Op. cit.*, p. 52.

Boykof, with regard to the influence of fermented mare's milk on the constituents of the urine, agree in the main, and incontestably prove that koumiss hastens the metamorphosis of the tissues.

It is also highly probable that if the perspiration and the exhalation from the lungs were analysed, further proofs would be discovered of increased tissue change. But although koumiss hastens the metamorphosis of the tissues on the one hand, it still more quickly builds them up on the other. While the old elements are removed, new ones, only in greater quantity, at once take their place. The supply, in fact, is in excess of the waste, although the waste is considerably increased. The stimulated activity of the circulatory system favours rapid tissue change, while the rich condition of the nutritive fluid supplies as much food as the tissues are able to absorb and transform. The appearance and small amount of the fæces of a person who, though taking fermented mare's milk in large quantities, is not confined exclusively to that diet, demonstrates not only how perfectly the milk itself but all other kinds of food taken with or after it, have been digested and absorbed. This improvement in the powers of digestion and absorption is at the root of that increased nutrition

of the body which so rapidly follows the use of koumiss.

But supposing a person were confined exclusively to a diet of fermented mare's milk, would that of itself prove sufficient to support life? Is an adult able to take koumiss for any length of time in quantities large enough to supply the waste of his body when that body has moderate work or gentle exercise to perform? An answer will of course depend upon how much koumiss an individual can consume. The nomad, for instance, can easily overcome, on a hot summer's day, from three to four gallons, and even more, of fermented mare's milk; while it is by no means uncommon to see consumptive patients drink upwards of ten champagne-bottles full of koumiss in twenty-four hours.

Now ten bottles of mare's milk contain sufficient nutriment to keep the body in health and good condition. Thus if Moleschott's tables be accepted as correct, it will be found that he considers 22.85 oz. (less the salts) of aliment in a dry state adequate for the nourishment of the adult human frame under ordinary circumstances, viz.—

Nitrogenous matters,	.	.	.	4.58 oz.
Fat,	.	.	.	2.96 „
Carbohydrates,	.	.	.	14.2 „

The mean dietary of the French, British, Prussian, and Austrian soldiers during peace, contains, according to Dr Lyon Playfair, the following solids:—

Nitrogenous matter,	. . . . .	4.215 oz.
Fat,	. . . . .	1.397 „
Carbohydrates,	. . . . .	18.69 „

or 24.29 oz. in all.¹ Now, if we take the average of the seven analyses of mare's milk I have cited in Chapter II, we shall find that in every ten champagne-bottles (taking each bottle at, on an average, 25 oz.), we have of—

Nitrogenous matters,	. . . . .	4.8 oz.
Fat,	. . . . .	4.3 „
Carbohydrates,	. . . . .	15.2 „

or 24.3 oz. of solids, a quantity sufficient to nourish those even who are engaged in active work.

But this is the case with milk, not with koumiss, where the greater portion of the lactine has been converted into alcohol, lactic acid, and carbonic dioxide. Now, although alcohol tends to arrest the metamorphosis of the tissues, and saves, by being burned up in the body, the other carbohydrates and the fats from oxidation, it is impossible that, as an article of food, it can supply the place of the lactine from which it has been produced by fermentation.

¹ On the Food of Man in Relation to his Useful Work. Edinburgh: 1865.

It is probable, on the other hand, that the lactic acid, as it is simply the milk-sugar split in two, can accomplish as much as the lactine from which it is derived. The experiments of Professor Cantani, of Naples, in regard to the action of lactic acid in diabetes, speak strongly in favour of such a supposition.

Moreover, it should be remembered that, as fermented mare's milk, in spite of the alcohol it contains, favours the metamorphosis of the tissues, a larger percentage than usual of nutritive material, nitrogenous as well as non-nitrogenous, will be required to support the system during the period that the koumiss cure is resorted to.¹

¹ The statement of Dr Stahlberg, that five bottles of koumiss are sufficient for the support of an individual of "average appetite," is, as a reference to the tables just quoted will show, quite misleading.

CHAPTER VII.

THE THERAPEUTICAL ACTION OF KOUMISS.

AN acquaintance with the physiological action of koumiss may serve as a safe guide to the comprehension of its therapeutic effects, and of the maladies in which its employment is likely to be followed by favourable results. Indeed, if we remember that koumiss is mare's milk—*i.e.*, the milk which most nearly approaches woman's—rendered highly digestible by the lactic acid, carbonic dioxide, alcohol, and casein in solution, which have been superadded to it by fermentation, its efficacy in combating wasting diseases is easily explained. It is not only that the alcohol and lactic acid favour the digestion and absorption of milk, but after being themselves carried into the circulation, they produce certain specific therapeutic effects on the system.

Thus, however serious and uncompromising the difference of opinion may be among modern physi-

cians with regard to the moderate use of, or total abstinence from, alcoholic drinks in health, none deny their importance when used medicinally, particularly where the stomach is in need of its muscular and mucous coats being stimulated to increased action. The extreme importance of lactic acid, again, in all cases of indigestion due to a deficiency of gastric juice, has been too much overlooked by many therapeutists,¹ while the administration of muriatic acid to correct the defective acidity of the chyme has been followed by no permanent, and by but slight temporary, benefit. After the use of koumiss, however, for several days or weeks, the furred tongue generally becomes clean, first on the edges and then on its whole surface; the appetite is sensibly increased, and food ceases to lie heavily on the stomach. It is in these instances that the remarkable fact strikes one of large doses of koumiss containing perhaps twice as much nutriment as the patient was able to take for months previously, not only not interfering with, but greatly increasing, the appetite. Even in those cases where the tongue was

¹ Majendie, however, and later, Dr Handfield Jones, have highly recommended lactic acid, and used it with success in the treatment of atonic dyspepsia.—*Vide* Majendie's 'Formulaire pour la Préparation et l'Emploi des plusieurs nouveaux Médicaments,' and Dr Handfield Jones's 'Functional Nervous Diseases.'

red, void of epithelium, and its papillæ shining and prominent (proofs of extreme gastric irritation and excess of acid in the stomach), and where severe heartburn accompanied every meal, the employment of koumiss acted beneficially in the long-run, although it rather increased the symptoms at first. After a while the cardialgia and dyspepsia disappear entirely, while the tongue assumes its natural appearance. Indeed, in extremely irritable states of the stomach or intestines, strong koumiss in small quantities seems to be the only food that can be borne. This cannot be ascribed either to the carbonic dioxide, or to the lactic acid, or to the alcohol singly, but probably to all three combined.

As soon, of course, as the gastro-intestinal irritability is allayed, the digestion and absorption of food are facilitated. The digestive organs are then able to assimilate very considerable quantities of koumiss, and the nutrition of the whole body improves accordingly.

Now this very improvement in the nourishment of the organs of digestion and assimilation leads to a more perfect performance of their respective functions, and enables the patient to make considerable changes both in the quality and amount of his food. It is not only that the invalid's appetite improves

greatly, but articles of diet which disagreed with his stomach prior to the koumiss cure are easily digested and assimilated after several weeks', sometimes days', use of fermented mare's milk. The following case of old standing gastric catarrh, in which koumiss enabled the patient to return to food to which she had long been a stranger, may serve as an excellent example.

Mrs M. P., aged forty-eight, had been a sufferer for upwards of eight years from dyspepsia, the ingestion of the simplest articles of diet being frequently followed by vomiting, griping, and purging. She was reduced to a mere skeleton, and was barely able to move about. Koumiss, even in the smallest doses, had no effect on the diarrhœa, although it arrested the vomiting. Dr Tchambulatof, whose patient she was, then added a large quantity of alum (thirty grains to the bottle) to the fermented milk, with the result that in about a week the diarrhœa had ceased entirely; in a month the patient was able to eat of everything, including raw cucumbers, water melons, musk melons, &c., and in eight weeks she left the establishment, feeling quite well, and having gained largely in weight. The following spring she asked me to call on her, and inquired whether I thought she should again repair to the

steppes, or whether she might drink koumiss in or near St Petersburg. She informed me that the last year of her illness, she was unable to digest anything but toast and beef-tea, and that even that frequently disagreed with her; whereas after the koumiss cure, she denied herself nothing in the way of diet, and that cucumbers, fruit, chestnuts, malt liquors, smoked fish, &c., were all consumed with impunity.

A remarkable feature which distinguishes the therapeutic from the physiological action of koumiss is, that while its consumption in very large quantities somewhat lessens the appetite of those who are in health, it greatly, in most instances, increases the desire for food, of those suffering from wasting disease. Now it is easy to explain this phenomenon in catarrhal states of the stomach where the most distressing symptoms being once removed, and the koumiss acting as a stimulus to the gastric mucous membrane, a strong craving for food may arise. But in cases of pulmonary consumption, it is difficult to discover a reason why the introduction of a nourishing fermented liquid in large quantities into a healthy if feeble stomach, should increase the desire for other kinds of nutriment in so marked a manner.

: Of the remarkable appetites of phthisical patients

while undergoing the koumiss cure, I have seen some notable examples. Thus whenever I stayed at Dr Postnikof's I always lunched and dined at the table where from forty to sixty consumptive invalids took their meals, and it was comforting to observe with what energy the knives and forks were plied. Persons who several weeks before being treated with koumiss had simply played with their food, now seemed to consider the act of eating as the most serious duty of the day. One case struck me as more remarkable than, although it may serve as a good example of, the rest. As the patient gave me permission to publish his case, I give it here in full.¹ Dr T., aged thirty-one, the late Professor of Botany in the University of Moscow, had suffered from laryngitis, chronic bronchitis, and hæmoptysis in the winter of 1869. He had lost a sister from consumption. The summer after the spitting of blood he rallied, although two winters subsequently he was again attacked by hæmoptysis, which lasted for a month. Hectic set in and left him very weak by April, when tubercular deposit was diagnosed in the apex of the right lung. He was sent to the Crimea, and lived there from April till October. He took sea baths, and underwent the grape cure for six weeks

¹ Case XXI. in table (next chapter).

but his general health hardly improved. He spent the autumn in Moscow, and felt comparatively well. In December he had a severe attack of pleurisy, with effusion on the right side, which almost carried him off. He was laid up for five months, but there was no return of hæmoptysis. In June 1873 he went to the Bashkir Steppes, but caught cold there and had another attack of hæmoptysis. He travelled thence to Saratof on the Volga, where he drank medium koumiss for six weeks, at the rate of seven bottles a day. He felt so much better and stronger on his return to Moscow, that he got married. The autumn was spent in Meran, the winter in Rome and Pisa. Spring again in Meran, summer in Davos (6000 feet above the sea level). Felt remarkably well all along. In 1874, his second year abroad, he worked hard, and lived in Strasburg during the winter. Cough and weakness returned in December. He then went to Pisa, where he spent six months, and felt so well that he was able to work fourteen hours a day with the microscope. He felt a tightness across the chest in May, however, soon followed by cough and the spitting of a tumbler-full of blood. Paris, Florence, then one month in Davos, and back to Moscow by the 21st July. Not so well as after first year abroad. Next winter, 1874-75, had a dryness in the throat, husky

voice, cough (worse in the rooms), and hectic every evening. He lectured until January, when severe hectic and cough, with difficult expectoration, set in. Hæmoptysis, to the extent of two ounces, occurred towards the end of January, and continued reappearing very frequently, almost daily. The fever was absent two days prior to the hæmoptysis, but the temperature kept above 40° (104° Fahr.) for a week. He was leeches twice at the anus (four leeches each time), with a view of arresting the spitting of blood, which continued, however, off and on till May. He was so weak that he could only move about in a wheeled chair. The temperature gradually fell during these four months at the rate of about 1-10th of a degree every week. He was advised to give koumiss another trial. On his way to Dr Postnikof's, hectic set in again, but not severely. On the 4th July he arrived in Samara, and commenced taking medium koumiss, one bottle daily, and gradually increased the dose till he consumed eleven bottles a day. There was complete anorexia when he came to Samara, but after taking koumiss for a week, he was literally able to eat for two. Thus a couple of chops or steaks at luncheon, and a double helping of meat at dinner, *plus* eleven bottles of koumiss during the day, soon made him regain lost

flesh. He increased $14\frac{1}{2}$ lb. in weight in thirty-two days, or at the rate of nearly half a pound daily. On the 6th August, however, he had a return of his old enemy, hæmoptysis, which lasted six days, and came on twice daily, to the extent of a slop-basin full at first. The expectoration and cough increased slightly afterwards, although by the 21st August (the day when I examined him), *i.e.*, a fortnight after the appearance of the spitting of blood, he had only lost 5 lb. of the $14\frac{1}{2}$ lb. he had gained. He was again picking up. I found the following physical signs in his chest:—

Right.—Percussion clearer under the clavicle, but absolutely dull in the supra-spinous fossa. There was loud bronchial respiration and bronchophony over the whole of the upper half of the lung. The bronchial voice was most clearly heard, however, above the clavicle, and in the supra-spinous fossa. The respiration was wavy in the mammary region of the *left side*. This patient spent the winter abroad, in Naples, if I mistake not, and returned to Moscow the following summer, but did not proceed to the steppes. He died in the autumn of 1877.

It is not only in regard to the appetite, but also the pulse-rate, that in some diseases the therapeutic differs from the physiological action of koumiss. It

has already been pointed out that the cardiac contractions increase in frequency, and continue so, more or less, in the great majority of cases, during the employment of fermented mare's milk in health. In most diseases, however, attended by poverty of blood, and particularly in phthisis, I found that nearly all the patients whom I had sent to the steppes to drink koumiss, presented, after a while, a falling off in the pulse-rate of from five to thirty beats per minute. This phenomenon may be explained by supposing that the stimulant action of alcohol was in the ascendant at first, but that after the tone of the nervous system and of the muscles of the heart had improved, by their being nourished with healthier blood, the cardiac contractions, as is usual in such instances, became more perfect and less frequent. In cases of consumption, on the other hand, the considerable fall in the pulse-rate, which was observed whenever any improvement resulted from the koumiss cure, had to be ascribed chiefly to the cessation or amelioration of the hectic.

I regret that my observations in regard to the pulse-rate in consumption do not coincide with those of so eminent an authority and careful an observer as Polubensky.

The changes produced by the employment of koumiss on the secretions of the air passages, its influence on the cough, and the possibility of its favouring hæmoptysis, will now have to be considered. The expectoration, which, in cases of chronic bronchitis and pulmonary consumption, is thick, yellow, and compact, and brought up with extreme difficulty, changes its physical properties, and becomes, after koumiss has been employed for but a few days, more abundant, thinner, less tenacious, and semi-transparent. It is also easily coughed up. At times the sputum is somewhat frothy as well as thin, although no difficulty has been experienced by the patient in getting rid of it.

The distressing cough of phthisis, and the frequent and laborious efforts at expectoration in certain cases of chronic bronchitis, are almost entirely removed, and in a very short time, by koumiss. Indeed, what struck me most at the luncheon and dinner tables at Dr Postnikof's, and at the dancing-parties, given twice weekly, at Dr Tchembulatof's, was the almost total absence of cough among the patients. At meals one hardly ever heard it, while those even who indulged to excess "on the light fantastic toe," seemed to suffer from breathlessness rather than cough.

The action of fermented mare's milk in causing a hyperæmic condition of the mucous membranes in general, of course includes that of the respiratory track; and it would be natural to suppose, from a *priori* reasoning, that hæmoptysis would be a frequent accompaniment of the koumiss cure when applied to phthisical patients. Such is not the case, however, as we shall see later on. This may be explained on the ground that the capillaries, while over distended by the alcohol in koumiss on the one hand, are strengthened by the improved quality of their blood supply on the other. They are better able to resist over distension, in fact. The occasional occurrence of hæmoptysis during the cure—an accident which I consider no more frequent than when that cure is not resorted to—is accounted for by Polubensky by the increased quantity of blood, which is suddenly, through improved nutrition, thrown upon the circulatory system, before the latter has had time to dispose of the former equally throughout the various parts of the body. This temporary plethora, the result of preceding anæmia, is followed by congestion of those organs which are weakest and least able to withstand the increased blood pressure. After a while all parts of the system thoroughly accommodate themselves to the general

hyperæmia, and the head and chest symptoms experienced by anæmic patients wholly disappear.

The perspiration of many individuals, after having undergone treatment with fermented mare's milk, gets impregnated with the peculiar odour of koumiss ; while the night-sweats, which are so troublesome and weakening to consumptive patients, become, in the majority of cases, less abundant, and after a few weeks of the cure, cease entirely. The beneficial results of the diaphoretic action of koumiss must be ascribed, according to Polubensky, to the skin relieving the lungs of part of their function. This is more perfectly accomplished by the kidneys, however, the secretion of which, as we have already seen, is considerably stimulated during the koumiss cure. Further, as has been pointed out in the preceding chapter, the metamorphosis of the tissues is increased by koumiss, and the *débris* of the increased tissue change has to be carried off by the kidneys, skin, and lungs—the natural balance being pretty evenly preserved between them.

The sleep, which may be short and troubled at first, particularly among those suffering from anæmia, gradually becomes more calm, prolonged, and refreshing. These phenomena are caused by increased activity of the circulation in the brain,—an activity

which the weakened nervous centres are irritated by at first, but which, as their nutrition improves, they soon get accustomed to. The ultimate amendment in regard to the patient's rest is also due, in great part, to the cool dry night air of the steppes, which, succeeding the baking heat of the day, acts as the best of sedatives. Phthisical patients, whose rest has been disturbed by cough, expectoration, and night-sweats, find their sleeplessness wear away as the above symptoms improve.

The catamenial discharge during the koumiss cure is more abundant, lasts longer, and appears, as a rule, before its usual time. Such are the observations of Polubensky,¹ Stahlberg,² Lutostansky,³ and Jushkewitch.

Thus Polubensky cites three cases where menstruation reappeared after having been long absent, owing to wasting disease. Dr Postnikof's experience, however, seems to be the very reverse of this, for he asserts that "every female, on commencing the koumiss cure, should be informed that the first menstruation during treatment is either absent or lasts but a short time. A complete suppression of the menses is generally observed among very weak

¹ *Op. cit.*

² *Op. cit.*

³ *Przegląd Lekarski* Rok xi., 1872. Krakow.

patients."¹ He also states that the use of koumiss in menorrhagia gives highly favourable results.

Dr Stahlberg refers to the remarkable phenomenon he has frequently witnessed, that the extreme suffering in painful menstruation (dysmenorrhœa) sometimes ceases entirely during the employment of koumiss.²

In three consumptive patients that had come under my notice (Cases VI., XIV., and XVII., in the table given in the next chapter), the catamenia soon returned after the employment of koumiss. In two instances it had been absent two months, and in a third, six months. On returning, however, it continued regular, so long as there was nothing to weaken the patient.

I am not aware that any observations have been published with regard to the action of koumiss on the *gravid uterus*. Dr Jushkewitch informs me that he has seen abortion follow in four cases, and premature labour in two, where large quantities (from fifteen tumblers and upwards) of fermented mare's milk were consumed daily.

There can be no doubt, however, that koumiss acts beneficially in most of those cases of painful or deficient menstruation which are referable to anæmia.

¹ *Op. cit.*, p. 72.

² *Op. cit.*, p. 19.

The most striking, however, of all the effects produced by koumiss in anæmia, consumption, and other wasting diseases, is the rapid manner in which lost flesh is regained, and the remarkable improvement in the outward appearance and spirits of the patients.

After a few weeks of the koumiss cure, the hitherto conspicuously prominent bones get covered with a thick coating of fat and muscle; the sunken and bloodless cheeks fill up and assume a rosy hue; the drooping spirits revive.

In illustration of the remarkable improvement caused by koumiss in the outward appearance and spirits of invalids, I shall cite the two following examples:—

Professor P. (Case XX.), a phthisical gentleman, was sent by me to Samara for the koumiss cure. I visited the establishment, to which I had directed him, six weeks subsequently, and was addressed by a round-faced, fresh-coloured, and plump individual, whom I failed to recognise.

“You don’t seem to remember me,” he said. “I am the patient whom you saw in consultation with Dr Gratsiansky in St Petersburg.”

The consumption of five bottles of koumiss a-day, the improved appetite resulting therefrom, and the steppe air had increased his weight $14\frac{1}{2}$ lb., and had

not only filled out his sunken cheeks, but had thrown colour into them as well.

Miss C., aged sixteen, a young lady who had been attended by me for chlorosis during two years, without her malady showing any except slight temporary signs of improvement, was advised to try koumiss at Dr Ebermann's establishment at Tsarskoe Selo, in the vicinity of St Petersburg. I had not much faith in koumiss effecting wonders in her case, as she had been to the country, had drunk milk there, and had breathed the bracing air of the Finnish hills for eight weeks with hardly any amelioration of her symptoms. I saw her six weeks after she had commenced the cure, and was astonished at the improvement that had taken place, particularly when informed that she had never been able to exceed one bottle of koumiss per day. There was no increase of weight in this case, which belonged to a class where the development of adipose tissue is, if anything, rather above the average; but the improvement in the colour of the skin and mucous membranes was striking. The blanched lips had become red; the pale cheeks pink; the dull eye bright; while the spirits, drooping and apathetic before treatment, had risen to a high pitch.

It is a mistake to suppose that the rapid change

in the outward appearance of those who resort to the koumiss cure is produced solely by the deposit of fat in the subcutaneous cellular tissue. The rosy cheeks and remarkable improvement in the strength and powers of endurance of the invalid, tell a different tale. All the muscles of the body, in fact, and chief among them the heart, are, as a result of the koumiss cure, stronger and better able to perform their functions, because of being nourished with a richer blood than they had been before. Surely it is not merely owing to increased development of adipose tissue that patients who, for months anterior to the koumiss cure, barely possessed strength enough to walk across the room, are able, in a short time, and solely owing to the treatment by fermented mare's milk, to take long walks, ride many miles on horseback, and even take part in the dance, with a vigour little if at all inferior to that of their healthy partners.¹

As a matter of fact, the most nourishing and skilfully selected dietary without koumiss, would never give us the results that are as a rule so easily obtained by a combination of fermented mare's milk

¹ Dr Boykof, among the many paradoxes to be found in the few pages of his thesis, ascribes the improvement in weight of those who have drunk koumiss to an increase in the amount of water in their bodies!

with an ordinary, chiefly meat, diet. Thus the marvellously rapid increase in the weight of patients undergoing the koumiss cure, has been noticed by every visitor of the Steppes of Orenbourg and Samara. I have seen some striking instances myself, and have heard of others even more so from the most trustworthy sources. A still more remarkable circumstance is that these were not cases simply of anæmia, gastric catarrh, syphilis, scurvy, or chronic bronchitis, but of far gone pulmonary consumption or tuberculosis.

Now as an improvement in the weight of the patient is, in the vast majority of cases of phthisis, considered as the most hopeful of all the symptoms that points to an arrest of the malady, I shall cite a few examples, some of which I have seen myself, and a few that have been communicated to me by Dr Postnikof and the late Dr Tchambulatof.

The most remarkable case in my experience in regard to rapid increase of weight was that of Professor T., of Moscow, already referred to, who, while taking considerable out-door exercise, gained $14\frac{1}{2}$ lb. in thirty-two days, or nearly $\frac{1}{2}$ a lb. per day. Another example was that of a young lady (the sister of a physician), whom I had met at Dr Tchambulatof's establishment. She had cavernous gurgling on one

side, and dulness and barely audible respiration under the clavicle of the other lung; yet she gained 16 lb. in six weeks; was able to take long walks in the steppes, and to join occasionally in a round dance.

Mr R. (Case VII.), who suffered from severe hæmoptysis on several occasions before and during the koumiss cure, gained 15 lb. in two months.

Mr Z. Y. (Case VIII.), who came with tubercular deposit in both lungs, and laryngeal phthisis, grew 14 lb. heavier in two months, and although brought to Dr Tchambulatof's in a dying state, was able, towards end of the cure, to walk, ride, and dance beyond the pale of moderation.

Mr O. (Case XV.), with humid crackling over the upper half of one lung, and wavy respiration under the clavicle, and prolonged expiration in the supra-spinous fossa of the other, gained $23\frac{1}{2}$ lb. at Dr Tchambulatof's the first season, and 15 lb. the second, making the second summer twice as much as he had lost during winter. Two still more remarkable instances of increase of weight in phthisical patients have been related to me, the one by Dr Postnikof, the other by the late Dr Tchambulatof.

In Dr Postnikof's case, a phthisical lady, aged twenty-seven, was sent to him for treatment by her

husband, a physician to whom she was but recently married. The latter had extracted a promise from his wife that she would not return home until she had consumed 300 bottles of koumiss,—a quantity which he not unreasonably considered would keep her in the steppes about two months.

With praiseworthy desire to make their separation as short as possible, she attacked koumiss with more valour than discretion, and succeeded, on the twenty-eighth day from the commencement of the cure, in finishing her 300th bottle. Beginning with five bottles a-day, she was able, towards the conclusion of the fourth week, to “punish,” as the old toppers used to say, eighteen bottles in the four-and-twenty hours. Her appetite kept pretty fair. She gained 22 lb. during one lunar month, or $\frac{11}{14}$ ths of a lb. per day.

The gain in weight in Dr Tchambulatoſ’s patient was even greater actually, and very much greater relatively, for it was a case of cavity in each lung, accompanied by hectic and extreme exhaustion.

Mr A. R., with cavernous gurgling in both lungs, tried koumiss at Dr Tchambulatoſ’s in 1864, and after two and a-half months’ treatment returned 16½ lb. heavier to St Petersburg, where he spent the winter, lost flesh towards spring, and went back to the steppes in May, when he again gained

strength and weight. The expectoration became less abundant, and the dyspnoea, from which he had suffered greatly, improved to such an extent, that he was able to take walks of upwards of four miles. The third summer, the cavernous gurgling became less and less audible, and the two vomicæ at last closed up,—dulness on percussion, and the absence of respiratory murmur, being the only physical signs left over the seat of the previously existing cavities. The patient gained 25 lb. that summer. The fourth season he returned to Tchambulatoſ's weaker than he had left the establishment the summer before, but much stronger than in former years. No new physical signs could be detected in the chest. He rapidly regained lost strength and weight, and returned a fifth, sixth, and seventh time to the steppes, always making up in summer, for what he had lost in winter. The seventh season, when out shooting in a bog, he was drenched to the skin, caught cold, and was seized with double pneumonia. He insisted, in spite of Dr Tchambulatoſ's urgent advice to the contrary, upon starting for St Petersburg, but only got the length of Samara (forty miles from Tchambulatoſ's), where he died.

During all the seven summers he spent in the steppes, he had frequent attacks of hectic, which

weakened him considerably at the time, but from which he rapidly recovered.

Of course an increase of weight in consumptive patients undergoing the koumiss cure to the extent of from 15 lb. to 25 lb. is not the rule; neither, however, is it so rare an exception as might, *a priori*, be supposed. In the next chapter I have brought forward a table of twenty-five cases of pulmonary consumption—using the term in its widest signification—which I had become acquainted with closely, almost from the time that treatment commenced to within a few months past. Some of these cases it would be unfair to cite when discussing the koumiss cure, as they hardly drank any mare's milk, and simply came, or were sent, to the steppes to die. Such are Cases XXIV., XXV., and even XIX. I have not omitted them, because they form part of the comparatively small number whose histories I have been able to trace from the beginning of their illness to the end—*i.e.*, to their death, or to a continuation of their existence till quite recently. Now it will be observed, on referring to the above-mentioned table in the next chapter, that the gain in weight in those cases where it could be ascertained, ranged from 7 lb. to 24 lb.

A few of the patients were unwilling to have themselves weighed, while others were in establish-

ments, or among the nomads, where scales were unknown. They all asserted, however, that they had increased in weight, except Cases XXIV. and XXV., who had lost flesh considerably. I have not excluded the last two cases from my calculations, although they were barely able to drink koumiss.

Several of the patients have been many times to the steppes, but I have confined myself to noting the gain during their first and second visits only. Thus of seventeen patients whose weight was correctly ascertained, eight were weighed at least twice. But while the gain of weight, after two months of the koumiss cure, ranged from 7 lb. to 24 lb., the average gain was, in round numbers, $11\frac{1}{2}$ lb. per patient.

I very much doubt if change of climate during summer, or a resort to the German mineral springs, such as Soden or Ems, to which some physicians continue sending their patients with a pertinacity hardly justified by the results obtained, would ever add $11\frac{1}{2}$ lb. to the majority of those whose lungs are undergoing retrogressive change. I well remember that of the 560 cases of chest disease which passed through those wards of the Brompton Consumption Hospital to which, seventeen years ago, I was attached as resident clinical assistant, very few

(of those who gained in weight) left the establishment more than from 3 lb. to 5 lb. heavier than what they entered it. Those whose improvement exceeded 5 lb. (there was one patient in the third stage of phthisis who increased $17\frac{1}{2}$ lb.) were, as a rule, either cases of cardiac disease, emphysema, or bronchitis, not of pulmonary consumption. Now the patients (according to the then existing regulations) remained three months in the Brompton Consumption Hospital, and if they progressed favourably, six weeks additional were allowed them, and, in some few instances, yet another six weeks. Thus they had plenty of time to improve, if improvement were possible.

Nearly all the cases, on the other hand, that I had seen at the koumiss establishment in Samara, had been under treatment but two months. It is true that I was connected with the Brompton Hospital during the most trying season of the year for phthisical patients — viz., from December to July; and although everything was done to remove local irritation from their lungs (by the wards and corridors being well ventilated, warmed, and kept at an equable temperature), yet the want of fresh out-door air had a baneful and depressing effect on the constitution in general, and through it, on the pul-

monary affection. The patients at the Brompton Hospital, for example, improved in weight and general health during the first four weeks of their stay in the hospital (they were weighed every fortnight); they then—I am speaking of the majority—gradually lost not only what they had gained, but much of what they had brought with them. Among those who gained weight, both at the Consumption Hospital and in the steppes, the improvement was gradual, although the gain was greater at the commencement than towards the end of the treatment.

It will now be necessary shortly to refer to the diseases that have been relieved or stayed by koumiss. My own experience of the koumiss cure has been confined almost exclusively to watching its effects in phthisis pulmonalis, and in a few cases of gastric catarrh, anæmia, &c. But from what has already been stated in regard to the physiological and therapeutic action of fermented mare's milk, it will not be difficult to foretell what class of diseases it is most likely to combat successfully. Wherever defective nutrition and assimilation exist, there a course of koumiss will prove highly beneficial. Thus in all cases of anæmia, or rather spanæmia, however caused — whether by scrofula, scurvy,

albuminuria, enfeebled cardiac action, excessive menstruation, diabetes, or any other disease producing a severe drain upon the system, the ingestion of a highly nutritive and easily digestible food will remove many of the most distressing symptoms, and, in some cases, even cure the disease.

Of the action, even of small doses of koumiss in uncomplicated anæmia, I have cited the very instructive case of Miss C.

The more local or direct use of koumiss, in the treatment of certain affections of the alimentary track, is generally followed by marked and permanent benefit.

Thus old cases of dyspepsia, as well as the atonic state of the small and large intestines resulting therefrom, are rapidly relieved by koumiss. Patients whose digestion had for years been accompanied by extreme uneasiness or pain, and who were obliged to confine themselves to the simplest articles of food, soon after being placed on koumiss got rid of their distressing symptoms, their stomachs, after a while, seeming to acquire the power of digesting almost anything. I have cited the very instructive case of Mrs M. P., and can now refer to another as interesting, where the patient, a gentleman aged thirty-nine (Case XXII. in table), though suffering for many years

from pulmonary consumption, had that disease in a quiescent state, and was chiefly troubled by atonic dyspepsia. He consulted me in May 1873, and stated that from childhood the slightest cold produced cough and sore throat. He had been an invalid since 1860; disease had been detected in his left lung by Professors Zdekauer and Eck of St Petersburg, Traube of Berlin, and Oppoltzer in Vienna. In 1864 he was sent abroad, and spent four years in the south of Europe. The cough has quite left him, but he suffers from indigestion, flatulence, and acid eructations. The appetite is impaired, and has been so for three years past. He has not lost much flesh. A physical examination of the patient showed that the body was fairly nourished, the skin was flabby, and there were dark marks under the somewhat sunken eyes. The pupils were widely dilated. The tongue was broad and pale, but clean (the fungiform papillæ were somewhat prominent), and the indentations of the teeth were clearly marked on its edges. On the left side, the chest was considerably flattened under the clavicle, and the percussion was very much duller than over the corresponding region of the right side. There was humid crackling over the whole of the infra-clavicular, mammary, and scapular regions. There were

groaning rhonchi, and bronchial respiration above the clavicle and spine of the scapula. The breathing in the right lung was vesicular. The transverse diameter of the heart was increased, while the apex beat was between the sixth and seventh ribs.

I advised the patient to go to Samara, and try the koumiss cure. He called on me again towards the end of November, and informed me that he had been to the steppes for six weeks in summer, had drunk five bottles of koumiss daily, and had greatly improved in weight, and that all the dyspeptic symptoms, from which he had suffered for upwards of three years, had left him, and that his appetite was now good. The physical signs in the chest had undergone some change. There was no humid crepitation in the mammary or scapular region, but cavernous gurgling and bronchophony were audible above the clavicle and in the supra-spinous fossa. The tongue was clean as before, only not flabby, less broad, and with no marks of the teeth on it. He went abroad to escape the St Petersburg winter. In April 1874 he again called on me: his chest felt quite well, he said, and he had no cough, but there were signs of a return of his dyspepsia; his tongue was dry, red, and the papillæ prominent; there was loss of appetite, thirst, and flatus. The symptoms

were more like those of chronic gastric catarrh. His condition improved greatly under the use of lactic acid and bitter vegetable tonics, and a month afterwards he went abroad. I have not heard of him since.

It is not only in cases of dyspepsia, however, that koumiss proves invaluable, but whenever there is ulceration of any part of the digestive track. In ulcer of the stomach it constitutes the best of food, because of its easy digestibility and its sedative action on the mucous membrane; while in ulceration of the small or large intestines it is the safest of remedies, because it supplies a large amount of nourishment with the smallest amount of waste. In fact, when a patient is placed upon an exclusively koumiss diet, hardly any fæces are passed.

Dr Polubensky relates two interesting cases where long-standing catarrh and probably ulceration of the intestines had been completely cured by koumiss. I shall cite them in full, in Dr Polubensky's own words.

A man of fifty had been suffering for five years from indigestion after typhoid fever. The slightest indiscretion in diet produced severe diarrhœa, the food passing through undigested: at times there were sharp pains in the abdomen. These symptoms gradually increased in severity. Treatment proved

unsuccessful, and the last year of his illness, prior to using koumiss, every food he took was quickly expelled, quite undigested, either by the stomach or the rectum. The persistence of these symptoms made several experienced physicians regard the case as one of tubercular ulceration of the bowels, an opinion which the exhausted and emaciated look of the patient seemed to warrant. Koumiss at the commencement of the cure was also passed undigested. Boiled koumiss, which is generally given under such circumstances, was only occasionally borne. The invalid's patience, however, overcame these preliminary failures, and towards the end of the treatment he was well able to digest raw koumiss. He then tried bread and light soups, and they agreed with him. On passing gradually to other kinds of food, he soon discovered that vegetables and fruits, which had proved hurtful to him during five years, were digested as easily as any other article of diet. With the improved digestion, the nutrition of his body rapidly improved. I kept the case in sight for two years, during which time the patient continued in perfect health. The second case—that of a person affected with severe diarrhoea, the result of unhealed intestinal ulcers, that an attack of

dysentery had left behind—I was unable to watch to the end, although I saw the patient improve considerably. A year afterwards, I learned from the physician by whom he had been treated that he had quite recovered.”

Of the action of koumiss in scurvy, scrofula, syphilis, amenorrhœa, and other diseases where the blood is impoverished or poisoned, or the tissues are undergoing rapid waste, examples are cited in the works and pamphlets of the authors I have had occasion to refer to in Chapter I.

In all these maladies koumiss produced no specific action, but was simply the most digestible food that could have been employed with the view of improving the quality of the blood, and the nutrition of the body. Koumiss, however, has much more of a specific, or rather complete effect, in the three following diseases, viz.—

1. Albuminuria.
2. Diabetes mellitus.
3. Phthisis pulmonalis.

Let us consider each of these separately. Before doing so, however, I must own that I have seen koumiss employed in but one case of Bright's disease, and that I have never seen it used in diabetes.

With the case of albuminuria I am but imperfectly acquainted, and shall only be able therefore to give an outline of its history later on.

Cases of Bright's disease, however, that greatly improved under the fermented milk cure (cow's having been used), are recorded by several authors, and will presently be cited. But although fermented mare's milk has been employed in so few cases of albuminuria as barely to warrant the forming of any other than an *a priori* opinion on the subject, cow's milk in its natural state, or skimmed, or as butter-milk, has been successfully resorted to by many physicians, particularly by Inozemtseff,¹ Karell,² Niemeyer,³ Donkin,⁴ and Jaccoud⁵ (the latter even advocating it *because* of its diuretic properties), and Roberts for the cure of anasarca dependent upon chronic nephritis. Many of those, however, who have written most strongly in favour of the milk cure in Bright's disease, have been obliged to acknow-

¹ О молочномъ леченіи—Москва.

(On the Milk Cure. Moscow.)

² Edinburgh Med. Journ., Aug. 1866.

³ A Text Book of Practical Medicine. London: 1872.

⁴ On the Skimmed Milk Treatment of Diabetes and Bright's Disease.

⁵ "La Médication, ne l'oubliez jamais, ne produit ses heureux effets que la condition d'exercer une action diuretique regulierement proportionnelle à la quantité du lait ingeré."—Leçons de Clinique Medicale, p. 827. Paris: 1874.

ledge that a large number of patients soon get tired of an exclusively milk diet, which, with the best intention on their parts, they are unable to support for any lengthened period. But when the individual is able to support the milk treatment, no question, so far as I am aware, has ever been raised as to its *danger*. Not so with the use of fermented mare's milk, however, in regard to the use of which, in nephritis, there has been no want of warning voices. It is true that the alarmists all belong to a school in which the use of diuretics in albuminuria is regarded with unqualified horror. The idea of treating anasarca, dependent upon Bright's disease, by throwing extra work upon the kidneys, was, until lately, scouted by most London and nearly all Continental physicians. The views and practice of Professors Christison,¹ Alison,² W. T. Gairdner,³ and Grainger Stewart,⁴ and of the whole of the Edinburgh Medical School (in which diuretics were employed almost as a matter of routine in nephritis), have slowly but surely travelled southwards, however, and now seem—as generally happens when rational views are

¹ Granular Degeneration of the Kidneys. Edinburgh, 1839.

² Outlines of Pathology and Practice of Medicine. Edin., 1844.

³ Clinical Medicine. Edinburgh, 1862.

⁴ A Practical Treatise on Bright's Disease of the Kidneys. Edinburgh, 1871.

backed by successful practice—to be pretty firmly established there.

But dissentient voices still exist, and physicians as eminent as Dr George Johnson, Dr W. Roberts, and Professor Niemeyer deny as strongly as of old the utility of diuretics in relieving anasarca caused by Bright's disease. Thus Dr Roberts says that his own experience has not given him "a high opinion of their efficacy;"¹ while the late Dr Niemeyer asserted that "diuretics are to be strictly prohibited," and further on warns us that "*a vain groping* in search of a specific remedy, and a *vague planless exhibition of diuretics* after the dropsy has set in, are merely so many tokens of incapacity on the part of the physician."²

It is difficult to understand from the context what Professor Niemeyer means by "*a planless exhibition*," although one's curiosity is aroused to know what plan he himself adhered to, when, almost immediately after his severe condemnation, at page 33, of the employment of diuretics in "parenchymatous nephritis," he makes use of the following sentence at page 35 :—

¹ Reynolds's System of Medicine, vol. v. p. 26. Art. "Bright's Disease."

² *Op. cit.*, vol. ii. p. 33.

"Whatever the theoretical objections against the employment of diuretics may be, yet, in desperate cases, *recourse should always be had to them.*" (The italics are mine.)

It would be difficult to reconcile these glaring contradictions, which simply prove that if the practice of Professor Niemeyer, when he administered "diuretics," was successful, the theory upon which, in cases of albuminuria, diuretics were withheld, must have been fallacious.

It may not be uninteresting to see what Edinburgh physicians, and one of the highest London authorities on diseases of the kidneys, Dr Dickinson, say on the subject. Professor Christison and the late Professor Alison always used diuretics in albuminuria,—their favourite remedies being the cream of tartar (which Bright also recommended,¹ only as a laxative) and digitalis. My former master, Professor W. T. Gairdner, says in regard to this sub-

¹ Dr Bright advised the use of diuretics, particularly digitalis and squills, in the disease which now bears his name, but in a faint-hearted kind of way (Med. Reports, vol. i., Bright's Guy's Hospital Reports, 1836). Dr Todd also counselled their use in albuminuria, but only "when the congestion of the kidneys has been relieved" (Clinical Lectures, London, 1861, pp. 441-473). With both these eminent physicians, diuretics constituted but an insignificant part of the treatment, and yielded precedence to diaphoretics, purgatives, &c.

ject: "The objections still entertained by many to the use of diuretics in the acute and sub-acute forms of renal albuminuria are quite unfounded. From very careful observation of numerous cases of renal dropsy in all stages, I am fully convinced of the accuracy of Dr Christison's remark, made public so long ago as 1839, but too much overlooked among the speculative refinements of a more modern, but by no means more refined, pathology, that 'diuretics do not increase the coagulability of the urine in the early stage,—in many instances they appear to diminish it.'"¹ "I am even prepared to go further, and to say that, where diuretics fail, it is only in rare instances that other remedies will be found of material service. In simple renal dropsy, whether acute or chronic, I have generally found the free employment of saline diuretics, sometimes aided by chalybeate preparations, or by digitalis, and by the use (as a secondary or subordinate means) of the warm bath, the true key of the safe and efficient treatment, whether of the dropsy or of the albuminuria. And looking to the accumulated evidence of my own experience, and that of others on this subject, I confess I am quite at a loss to understand the modern bias in favour of diaphoretics and purga-

¹ On Granular Degeneration of the Kidneys, p. 140.

tives, as opposed to a diuretic treatment, except upon the ground of a theoretical prejudice, adopted without due consideration of the facts of clinical experience.”¹

Dr Grainger Stewart considers diuretics as the most “effective and reliable” of remedies “for the removal of the exudation and effete material from the tubules.”² His favourite diuretics are digitalis, acetate of potash, and water. Dr Dickinson strongly insists that in cases of Bright’s disease, “to prevent dangerous obstruction of the tubes, it is essential that a sufficiency of fluid should wash out the disturbed and accumulating cells.”³

“Formerly,” the same author observes, “it used to be common to treat renal disease in a somewhat indiscriminate manner, by purging and sweating,—perhaps compound-jalap powder every other morning, and a vapour bath every night. This exhausting plan was based on the idea that the diseased kidney, like a broken bone, stands in need of repose,—a condition which was sought to be obtained by exciting a vicarious activity on the part of the bowels and the skin. But it is evident, from the want of success

¹ *Op. cit.*, p. 672.

² *Op. cit.*, p. 112.

³ On the Pathology and Treatment of Albuminuria, pp. 115, 117, 118. Second edition. London : 1877.

which attends this practice, that *whatever good may be done by relieving the gland of its work is more than counterbalanced by the evil which results from the misappropriation of the aqueous fluid which is needed to keep the tubes clear.*" (The italics are mine.)

Dr Dickinson strongly advises the use of large quantities of water as the best of diuretics,¹—a remedy also highly spoken of by Dr Grainger Stewart.

I have entered thus fully upon the question regarding the advisability of employing diuretics in Bright's disease, because, their utility being once admitted, there can be no dispute as to the important part that koumiss—a remedy which signally increases the secretion of the kidneys, without stimulating them—may be made to play in the treatment both of the acute and chronic forms of albuminuria.

It is not only owing to the diuresis it produces, however, that koumiss ought to prove invaluable in Bright's disease, nor on the score of its decided though milder diaphoretic action, but in consequence of its being an excellent nutrient and alterative. It is also infinitely preferable to milk in this respect—that it can be consumed in much larger

¹ Edinburgh Medical Journal, 1864.

quantities, and that it can also be persevered in for a very long time without, as a rule, causing that feeling of repugnance with which many patients soon commence to regard milk when administered to them systematically. Invalids do not soon tire of koumiss, however, and chiefly, I believe, for the following reason: The constituent parts of that fluid being more numerous than the constituent parts of milk, it presents a greater variety of flavour in consequence.

Thus the lactic acid and carbonic dioxide in fermented milk stimulate and refresh the palate, which is also tickled slightly, no doubt, by the dash of alcohol present; while the absence in koumiss, particularly in *strong*, of any sweet, creamy after-taste, of which invalids so soon tire, makes its consumption even in large quantities not unpleasant. Indeed I consider that one of the chief causes why koumiss does not pall on the gustatory nerves, nor disagree with the stomach (which also has something to say in the matter), where sweet or skimmed milk so often does, lies in the greater monotony of the flavour—if I may be allowed the expression—of the latter. If the palate revolts against the too frequent repetition of any particular article of food because of its sameness, the stomach and alimentary track soon follow in its wake.

It will also be seen, on referring to the physiological and pathological actions of koumiss, that it fulfils all the conditions demanded of a medicine and an article of diet for the treatment of albuminuria. Thus it is more easily digested than milk, by those even who prefer the taste of the latter; it is an excellent hæmatic and trustworthy diuretic, and a mild sudorific; and although it has as yet been employed in but a limited number of cases of Bright's disease, it seems already to have given general satisfaction. Several well-known authorities on koumiss—and among them Polubensky, Bogoyavlensky, Stahlberg, Brzezinski,¹ and Lutostansky—have protested against its use in congestion of the kidneys; but as their opinions are based upon theory, not practice, the best answer to their objection lies in the remarkable success that has attended the administration of fermented cow's milk in acute and chronic Bright's disease, by Drs Landowsky, Carter Wigg, and Jagielski.

Thus Dr Landowsky² used fermented cow's milk with excellent results in three cases of albuminuria—

¹ *Der Kumys und dessen Anwendung in der Therapie*, von Dr Johannes Brzezinski. Berlin.

² *Journal de Therapeutique*, 1874.

1st, In chronic albuminuria, after scarlet-fever.

2d, In transient albuminuria, with anasarca (*Albuminurie passagère*).

3d, In albuminuria with anasarca.¹

Dr Carter Wigg² resorted to fermented cow's milk in a case of albuminuria with anasarca and heart disease, with great benefit to the patient; while Dr Jagielski³ was successful in treating two cases of acute nephritis with the same remedy. I have seen koumiss—*i.e.*, fermented *mare's* milk—used but in one case of Bright's disease. In 1874, I was consulted by a Scotch gentleman who passed through St Petersburg on his way to Samara to try the koumiss cure in the steppes. He had been a sufferer, he informed me, from albuminuria for three years, and had received much benefit from Dr Donkin of Durham, who recommended skim milk for his complaint. He had a physician travelling with him, and called on me more for the sake of inquiring about the steppes, and where to go to, than to ask my opinion as to the advisability of his drinking koumiss. He went to Dr Postnikoff's, and felt so much better from the fermented mare's milk he drank there, that he had

¹ Journal de Therapeutique, 1874.

² Lancet, 1875, vol. i. p. 72.

³ Effects of Koumiss upon the Urine in Health and Disease. London.

a Khirgiz milker and several mares sent to him to Egypt, where he spent the winter. He returned to the steppes next year, but hardly drank of koumiss, as he felt so well. He is still alive, and, if I mistake not, enjoying fair health.

We now come to the consideration of the use of koumiss in a disease where its utility is acknowledged from *a priori* reasoning, even by those who are strongly opposed to its application in albuminuria—I mean, diabetes mellitus. To admit the utility of koumiss in diabetes, however, it will be found necessary to accept without reserve Professor Cantani's theory of that malady. Dr Cantani of Naples considers diabetes to be a disease where there is a defective combustion of the starchy and saccharine materials of the food, which become converted into a morbid form of glucose, named by him *paragluco*se, —a substance that cannot be burned up, and which is therefore voided unchanged by the urine and other secretions. The heat of the body is consequently kept up at the expense of the albuminates and fats—a destructive process, which Dr Cantani attempts to prevent by supplying the system with an article of diet easy of combustion, so that the waste of the nitrogenous materials and carbo-hydrates of the food may

be thereby arrested. He has fixed upon lactic acid as the most easily combustible of foods, and as forming an intermediate stage between glucose and carbonic dioxide. The remarkable success which has attended Cantani's method, even in some apparently desperate cases, has been referred to by Dr Sammut of Naples;¹ while Dr George W. Balfour has recorded several instances where the use of lactic acid, with, of course, a strictly meat diet, or of fermented cow's milk, has been attended with brilliant results. The, of late, very successful skim-milk treatment of diabetes must yield precedence to that of lactic acid, combined with an exclusively nitrogenous diet; for, as Dr Balfour observes, "I may add that the results of the two systems in my own practice have fully convinced me of the greater applicability and more perfect success, so far as time allows me to judge, of Cantani's method." It stands to reason that the treatment of diabetes mellitus by koumiss would combine all the advantages of Cantani's method—*i.e.*, lactic acid, with the addition of easily digestible and assimilable nitrogenous and fatty materials; while it is not open to the objection raised against skim milk on the score of containing sugar to any appreciable extent.

¹ British Medical Journal, 1871.

There can be little doubt also that most patients will prefer taking lactic acid in the shape of koumiss to swallowing as much as from 77 to 154 grains (Dr Cantani's doses of it) dissolved in water, during the day. "Koumiss," observed Dr Balfour, at a time when fermented milk was but little known and used in Edinburgh, "ought to be a useful diet in diabetes."¹

To suggest the employment of koumiss in disease of the heart, of whatever nature, would look like heresy in the eyes of the majority of those who have written on the subject. There is hardly an author on koumiss that I know of,—and they all seem to regard diseases of the heart as a single entity—as *vitium organicum cordis*,—but considers the employment in such cases of fermented mare's milk with unfeigned horror.

Now in all cardiac affections, whether of organic or nervous nature, where there is a deficiency of blood carried to the organ itself, or where that blood is poor in quality, or lastly, where a more regular and perfect contraction of the muscular walls is needed, koumiss is likely to prove of the highest value. In other words, in all those maladies of the heart where *digitalis*, alone or combined with iron,

¹ Edinburgh Medical Journal, Dec. 1871.

arsenic, and nutritious food and gentle stimulation, does good, the employment of koumiss is indicated.

The diseases, therefore, in which it should be used are—(1) *Dilatation of the heart*, where there is not sufficient hypertrophy to overcome the causes which support, and which primarily produced, the dilatation; and (2) *aortic obstruction and insufficiency* (particularly the latter), where the blood is not sent in sufficient quantity to all parts of the body, and where the arteries remain unfilled. We therefore need, in aortic obstruction and regurgitation, a richer nutrient fluid and also a more perfect arterial recoil for sending that fluid through the coronary arteries to the heart,—the walls of which are but poorly fed in affections of the semi-lunar valves. Let us first consider the uses of koumiss in dilatation, however.

Now, all cases of cardiac dilatation, however caused, where the hypertrophy, if it exist, does not keep progress with the dilatation, and where the walls of the contracting organ need strengthening, are sure to be benefited by any remedy that improves the quality of the nutrient fluid. "In chlorotic and febrile dilatation," writes Dr George W. Balfour, "cure, as we know, is the rule; in dilatation from other causes, it is perhaps the exception;

but it may always be avoided, and is not unfrequently attained.”¹

Now how is this attained? According to all recent authorities who have carefully watched the action of remedies in diseases of the heart, and who have not pooh-poohed treatment (as has recently been the fashion with some representatives of the Nihilism of therapeutics), simply because a lesion happens to be organic,—most cases of hypertrophy and dilatation, whether alone or combined, need tonics, nourishing diet, and cardiac, and sometimes general stimulants. Thus by increasing the force of the cardiac contractions (by digitalis and small doses of alcohol), and by supplying the heart's muscular walls with a healthier blood (by generous diet, iron, arsenic, &c.), we do all in our power to produce a compensating hypertrophy where there was simply dilatation, and prevent dilatation where hypertrophys alone exists. “The measures which in hypertrophy are pursued in order to prevent dilatation are not the less indicated when the latter exists,” writes Professor Flint. “The great end in the management is to increase the muscular power of the heart.”²

¹ Clinical Lectures on the Diseases of the Heart and Aorta, by George William Balfour, M.D. London: 1876.

² A Practical Treatise on the Diseases of the Heart, by Austin Flint, M.D. P. 88. Philadelphia: 1870.

What, it may be asked, is likely to effect this better than a food easily digestible, easily assimilable, and which renders the blood richer, while it gently stimulates the cardiac contractions?

With regard to the employment of stimulants in heart disease, Dr Balfour says that "in elderly patients they are often useful, and occasionally necessary."¹

"Where a dose of alcohol improves the pulse," writes Dr Fothergill, "and enables the patient to eat and digest better, its use is indicated."²

There can be little doubt, then, in the mind of any one acquainted with the modern and most rational, as it certainly is the most successful, treatment of heart disease, that whenever the hypertrophy is not sufficient to compensate for the existing dilatation, koumiss ought to prove highly beneficial. This does not exclude the use of direct cardiac stimulants, such as digitalis; on the contrary, it assists them in their action, when they are employed for the purpose of improving the nutrition of the heart. Indeed what I would desire most strongly to insist upon is, that the successful employment in cardiac

¹ *Op. cit.*, p. 175.

² *The Heart and its Diseases, &c.*, by J. Milner Fothergill, M.D. P. 224. London: 1872.

hypertrophy and dilatation of digitalis, which causes an increased amount of blood to be sent to the muscular walls of the heart through the coronary arteries at each diastole, is likely to be followed by still more satisfactory results when the administration of that drug is combined with the koumiss cure, for the nutrient fluid will then greatly improve in *quality*,—a matter fully as worthy of attention in such cases as increased *quantity*.

And this brings us to the consideration of the uses of fermented mare's milk in diseases of the aortic valves,—obstruction and regurgitation.

Now in both these affections of the semi-lunar valves, the substance of the heart is poorly supplied with blood;—in the first instance, because of stenosis impeding the contents of the right ventricle from fully emptying themselves into the aorta at each systole; in the second, from the leakage of the contents of the aorta into the ventricle during diastole.

In both instances the insufficiency of aortic distension is followed by weakened arterial recoil, the result of which is incomplete filling of the coronary arteries during diastole, and consequent impoverished supply of blood to the heart. Now the employment of direct cardiac stimulants, such as

digitalis, has been recommended by most authorities for cases of aortic obstruction, where the hypertrophy of the dilated ventricle is not sufficient to overcome the impediment produced by stenosis.

In such cases an improvement in the condition of the fluid that feeds the cardiac muscles, when they commence failing adequately to perform their functions, is also called for; and no better aid, both as a nutrient and stimulant, to digitalis could be procured than koumiss.

The treatment of aortic regurgitation is a different matter, however; and until Dr George W. Balfour commenced employing digitalis, with brilliant results, in insufficiency of the semi-lunar valves, no physician had ventured to recommend or use the drug¹ in that disease. What always struck me, however, in the treatment of aortic regurgitation, was the very marked improvement I invariably observed in all instances where iron, a generous diet, and the moderate use of stimulants were resorted to.

¹ Even Dr Milner Fothergill, who has done more than any living author to place the action of digitalis on a correct scientific basis, and who has boldly and successfully resorted to it in the treatment of cardiac disease, asserts in regard to its employment in aortic regurgitation, "that it can rarely be indicated, and further, that its administration is hazardous."—*Digitalis: its Mode of Action and its Use*, by J. Milner Fothergill, M.D. P. 52. London: 1871.

This was before I read of or witnessed Dr G. Balfour's successful practice,¹ and when I still, in strict conformity with what I had been taught, eschewed the use of digitalis in such cases.

Now as the unfilled arteries in insufficiency of the semi-lunar valves carry a smaller quantity of blood to all organs of the body (including the heart itself) than these organs stand in need of, it is but natural that any treatment directed towards improving the condition of the blood, will be followed by very great amelioration of the distressing symptoms of the disease. Here, therefore, the employment of koumiss by itself, or as an adjunct to digitalis, is clearly indicated.

I have seen but one case of aortic regurgitation treated by koumiss, and the patient expressed himself greatly relieved; while the pallor of his skin, so characteristic of unfilled arteries, gave way to a healthier colour, the cheeks and lips even assuming a rosy tint. Of other diseases of the heart in which koumiss was drunk, I saw two: one was a case (No. XXII.

¹ It must also be remembered that Dr G. W. Balfour—keeping Pascal's law in mind, that the interior of the left ventricle, in insufficiency, is being "constantly dilated by a force equivalent to the column of blood, the height of the cranium above the heart, and of the diameter of the ventricular lumen"—lowers, in these cases, the height of the distending column, by keeping the patient as much as possible in a horizontal position.

in table) of hypertrophy of the right ventricle accompanying consumption. The patient was not in the least troubled with his heart symptoms before, during, or after the koumiss cure, which I advised him to undergo for improving the state of his lungs, and an atonic dyspepsia from which he had suffered several years. The other patient, a boy of nine years old, had disease of the right side of the heart,—obstruction of the pulmonary valves,—and was considerably benefited by six weeks of the koumiss cure.

Dr Werner, of Samara, informed me that a case came under his notice of mitral insufficiency (diagnosed eight years previously by Professor Skoda of Vienna), attended with anæmia, dyspnoea, great weakness, and frequent syncope. After the invalid had drunk of koumiss for a fortnight, commencing with one bottle, and ending with eight, daily, his general condition and all his symptoms improved so remarkably, that he thought he no more needed Dr Werner's services during the remaining six weeks of the cure. Two cases, where the use of fermented cow's milk in cardiac disease was attended with excellent results, are related respectively by Dr Brzezinski¹ and Dr Carter Wigg.² The former had a patient seventeen

¹ *Op. cit.*, p. 51.

² *Lancet*, 1875, vol. i.

years old under his care with mitral insufficiency, hypertrophy of the right ventricle, and chronic bronchitis. After six weeks' treatment with koumiss (four bottles daily) the cough diminished, and the previously existing headaches and nervous symptoms disappeared; the gain in weight was $4\frac{1}{2}$ lb. In Dr Carter Wigg's case, albuminuria and anasarca accompanied the cardiac mischief, although, unfortunately, we are not told what disease of the heart the patient suffered from. Very great improvement followed the use of koumiss in moderate doses.

The principal disease, however, in which fermented mare's milk has proved of benefit, and where its employment has been followed by the most brilliant results, are affections of the organs of respiration, more particularly pulmonary consumption. And in treating of the uses of koumiss in phthisis and pulmonalis, I would desire it to be understood that under the name of phthisis or consumption I shall include all chronic diseases of the lungs where there is consolidation or breaking up of the pulmonary tissue,—whether it be of a tubercular, pneumonic, or fibroid nature. For the subdivision of consumption into tubercular, pneumonic, tuberculo-pneumonic, syphilitic, scrofulous, &c. &c., while of little value clinically, is frequently liable to mislead, and cannot

affect our treatment in the slightest.¹ Indeed when we find so eminent a pathologist as Dr Henry Green asserting that "from a careful consideration of the histology and pathology of phthisis" he is "inclined to doubt the advisability of attempting, as has been done during recent years, to subdivide the disease into distinct pathological varieties;"² when such authorities as Dr Wilson Fox and Professor Rindfleisch defend the old views regarding the tubercular nature of phthisis,—apportioning to tubercle a much wider signification than it has received at the hands of Virchow and Niemeyer and their followers; and when, lastly, there seems as yet to be such a very wide difference of opinion among the greatest pathologists as to what *tuberculosis* really is and includes,³—I trust I shall not be considered unorthodox in classifying, under the name of phthisis pulmonalis or consumption, all chronic diseases of the lungs that present physical signs of consolidation, and for

¹ Of course when a patient is suffering from syphilis and phthisis, we shall have specifically to treat the former disease with the view of benefiting the latter.

² The Pathology of Pulmonary Consumption, by T. Henry Green, M.D. P. 97. London: 1878.

³ Dr H. Green, in answer to "What constitutes Tubercle?" replies, "From a consideration of the histological characters of the miliary lesions met with in the lungs in acute miliary tuberculosis, it seems to me difficult to frame a definition of pulmonary tubercle upon a purely histological basis."

the treatment of which koumiss has in so many instances been successfully prescribed.

But as the successful employment of fermented mare's milk for the relief of diseases of the lungs and air passages is so intimately associated in my opinion with the subject of climate, I shall have to reserve the consideration of koumiss in the treatment of pulmonary consumption for the next chapter, when the questions of where, when, and how koumiss should be drunk, will be fully discussed.

CHAPTER VIII.

STATISTICS OF THE MILITARY KOUMISS ESTABLISHMENT NEAR SAMARA—TABLE OF TWENTY-FIVE CASES OF CONSUMPTION TREATED BY KOUMISS—TABLE OF EIGHTEEN CASES OF PHTHISIS, PERSONALLY KNOWN TO THE AUTHOR, THAT WERE CURED BY FERMENTED MARE'S MILK—IN WHAT DISEASES THE EMPLOYMENT OF KOUMISS IS CONTRA-INDICATED—SHOULD IT BE AVOIDED WHERE THERE IS A TENDENCY TO HÆMOPTYSIS?—THE MODE OF USING THE DIFFERENT KINDS OF KOUMISS—HOW, WHEN, WHERE, AND IN WHAT QUANTITIES IT SHOULD BE DRUNK—MORALE OR ETHICS OF THE KOUMISS CURE—IMPORTANCE OF HORSEBACK EXERCISE AS PART OF THE TREATMENT—JOURNEY TO AND RESIDENCE IN THE STEPPES—CONCLUSION.

THE great difficulty in collecting a sufficient number of data, with regard to the influence of koumiss on the development or progress of pulmonary consumption, consists in the impossibility of being able to watch those who come under one's notice, from the commencement of the treatment to the arrest of the disease, or to the patient's death. Thus of many scores—I might almost say hundreds—of instances

of phthisis that I have seen undergoing the koumiss cure, on the six occasions that I visited the steppes, I have been able to watch the final result in twenty-five only.¹ Even in three of these cases (Nos. XXII., XXIII., and XXIV. in table) I am not quite certain of the result: two, I am sure, must be dead; while the third (No. XXII.), referred to in a former chapter, is, I have every reason to believe, still alive.

Dr Polubensky has been no more fortunate in this respect than myself, although he is the only author I am acquainted with who has watched and given the results of a small number of cases of consumption (treated by fermented mare's milk) from the beginning of the disease to the date of publication of his highly practical and philosophical essay. With regard to the collection, on the other hand, of cases of phthisis and other wasting diseases that have been benefited and greatly relieved by the use of koumiss during a single season, I shall be able,

¹ Patients who are willing and glad enough to consult a physician on the spot, and to pour a full history of their ailments, real or imaginary, into his ear, forget to write a few words to him afterwards. If they feel worse when they get home, they at once apply to their usual medical attendant; if better, they are even still less inclined to be grateful.

thanks to the kindness of Dr Kozloff, Director General of the Medical Department of the Russian Army, to place before the reader a record of the number of patients treated for several years past at the so-called "Military Koumiss"—a mare's milk establishment erected for soldiers in the vicinity of Samara.

These statistics, besides being extensive, are important as forming the only record where a number of patients had to undergo hospital discipline, and were placed under strict treatment; and they are also valuable because compiled by medical men (army surgeons) who started on their inquiries with no preconceived notions in regard to koumiss. To these must also be added the very interesting cases of Drs Neftel and Zeeland, which, though small in number, point out clearly the efficacy of koumiss in the treatment of the majority of cases of pulmonary consumption. Thus Dr Neftel had fifteen phthisical soldiers under his charge in the Orenburg Military Hospital in 1859; *they all improved and gained flesh during their stay there.* Moreover, he relates that the effect of koumiss in two other instances was marvellous: one being that of a young lady aged twenty-five, with cavernous gurgling in one lung,

who was cured by spending two seasons in the steppes; the other an officer, aged thirty-four, also with cavernous gurgling, and a sufferer from frequent attacks of hæmoptysis, who completely recovered.¹ The next year Dr Zeeland accompanied twelve consumptive soldiers to the Bashkir steppes beyond Orenbourg, where they drank koumiss for three months. Of the twelve, eight had phthisis in the second and third stages, and all improved; they lost the night-sweats and their cough, and grew stout. One patient, in the second stage, recovered completely; the bronchial respiration disappeared, and made room for vesicular. Three were suffering from the weakening effects of severe ague, and all got well. A Bashkir soldier, seriously attacked with scurvy, recovered in four weeks.

The weather that summer kept steady and warm; the patients were allowed as much sleep as they desired, and received $2\frac{1}{4}$ lb. of meat, $1\frac{1}{4}$ lb. of bread, $\frac{1}{2}$ lb. of meal, and from twenty to thirty tumblerfulls of koumiss daily.

The most extensive data in regard to the improvement in the general state and weight of patients—whether suffering from phthisis or any other wast-

¹ Würzburger Medicinische Zeitschrift, 1860. Erster Band.

ing disease, treated by fermented mare's milk—are supplied in the reports of the army surgeons in connection with the Military Koumiss Establishment near Samara. It is a pity, however, that only the average improvement in weight has been given, and that the diseases in which the patients gained most, as well as those in which they gained least, have not been specified except in a few rare instances. As the great majority of the patients, however, who were sent to the steppes by the military authorities, suffered from consumption and other diseases of the organs of respiration, the average of gain in their weight will convey a pretty correct notion of the action of koumiss in combating bronchial and pulmonary diseases in general.

I shall here cite the tables which I have copied from the MS. reports sent from year to year by the army surgeons in charge of the Military Koumiss Establishment to the Director-General of the Medical Department of the Russian Army. It will be easier further on to make deductions from them when considered *en masse*. Thus there were treated from the 15th May to the 15th August 1872,¹

¹ The omission of certain years (as 1873 and 1878) is simply owing to the reports having been mislaid at the War Office.

at the Military Koumiss Establishment near Samara,
fifty-two patients suffering from the following
diseases :—

Pulmonary tuberculosis,	18
Chronic bronchial catarrh,	27
Chronic bronchial catarrh with emphysema,	3
Pleuritic effusion,	1
Chronic intestinal catarrh,	1
Anæmia,	2
Total,	<hr/> 52

Of the 52 cases, 25 recovered, 16 greatly improved, 5 slightly improved ; in 5 there was no change ; and 1 died. The average gain in weight was $9\frac{3}{4}$ lb. per patient. Five patients gained respectively 44 lb., 34 lb., 25 lb., 23 lb., and 21 lb. Two of these cases were chronic bronchitis and anæmia (where 21 lb. and 34 lb. were gained) ; two were cases of tuberculosis (gain 23 lb. and 28 lb.) The fifth case, where the patient's weight had improved 44 lb. in six weeks, is worthy of special notice. The invalid was suffering from chronic gastric catarrh, with diarrhoea, borborygmi, and pain in the gastric and umbilical regions. The stools were frequent and painful, and there was complete anorexia. He had been under treatment in hospital (before being sent to the steppes) for three months, without any amelio-

ration of his symptoms. He gained 18 lb. the first fortnight, and was 44 lb. heavier at the end of the cure.

The following table shows the cases that were treated in 1874:—

Disease.	Number of cases.	Cured.	Improved.	No Improvement.
Chronic pulmonary catarrh, .	127	105	17	5
Chronic pneumonia (phthisis ?)	34	5	17	12
Tuberculosis,	3	2	1	...
Anæmia,	24	20	3	1
Scurvy,	1	...	1	...
Pleurisy and emphysema, .	11	6	4	1
Chronic gastric catarrh, .	2	2	...	...
Total,	202.	140	43	19

The average gain in weight was 8 lb.; while 18 patients of the 202 gained as much as from 18 lb. to 27 lb.

[TABLE.

In 1875 the following cases were treated :—

Disease.	Number of cases.	Cure.	Slight improve-ment	No change.	Improved consider-ably.
Chronic bronchial catarrh, . . .	124	84	6	8	26
Chronic pneumonia (phthisis?) . . .	32	9	5	6	12
Chronic pleurisy, . . .	7	4	1	1	1
Tuberculosis, . . .	30	6	4	14	6
Chronic, gastric, and intestinal catarrh, . . .	12	8	...	1	3
Anæmia,	28	23	...	1	4
Scurvy,	1	1	...	...	...
Total,	234	135	16	31	52

Of the 234 patients, 198 gained from 1 lb. to 27 lb.; 11 did not increase in weight; while of the remaining 25, 10 lost weight, and 15 were sent to the general hospital as unfit cases for the koumiss cure. The average gain in weight among these 198 was $6\frac{1}{4}$ lb., or less by $1\frac{3}{4}$ lb. than the average of the preceding year. This is ascribed by the physician who sent in the report to three causes: first, to the weather having been colder and more rainy; second, to the shorter time the patients were

allowed to drink the koumiss (the number of invalids being greater than the establishment could accommodate); and third, to the cases being of a graver nature. Thus in 1874, 18 invalids among 202 gained from 18 lb. to 27 lb.; while in 1875, only 5 out of 234 improved in weight to that extent.

The following cases were treated in 1876 :—

Disease.	Number of cases.	Cure.	Great improvement.	Slight improvement.	No change.
Chronic bronchial catarrh, . . .	100	68	19	9	4
Chronic pneumonia (phthisis?) . .	41	14	14	9	4
Chronic pleurisy, .	8	6	1	1	...
Tubercular phthisis, .	7	1	1	3	2
Chronic, gastric, and intestinal catarrh, .	2	...	1	1	...
Anæmia, . . .	11	9	1	1	...
Scurvy, . . .	3	3	...	...	...
Total, . . .	172	101	37	24	10

The summer of 1876 was warm and dry. The average gain was $8\frac{1}{2}$ lb. per patient, the officers gaining less than the men. Thus the average for the former was only $5\frac{2}{3}$ lb., for the latter $9\frac{1}{4}$ lb.

This circumstance, Dr Ilyin, who sent in the report, refers to the officers having the disease (phthisis) in a more advanced form. I think it might also be partly ascribed to the fact that koumiss proved a more important addition to the soldiers' comparatively simple fare than it did to the officers'. It appears also that of the officers, $\frac{3}{8}$ ths did not gain weight; of the privates, $\frac{1}{8}$ ths. Of those who improved in weight, 12 gained from 18 lb. to 35 lb.; 58 gained from 9 lb. to 18 lb.; 68 from 1 lb to 9 lb.; and 10 from 0 to $3\frac{1}{2}$ lb.

In the tables for 1877 and 1879 we have simply an index of the diseases and the results of the treatment given, without any reference to the change in the weight of the patients. I shall therefore join the two tables into one, which will give us the following figures for the Military Koumiss in 1877 and 1879:—

[TABLE.

Disease.	Number of cases.	Cure.	Slight improvement.	No improvement.	Death.
Chronic pulmonary catarrh, . . .	160	96	30	33	1
Chronic pneumonia (phthisis?) . . .	96	22	59	15	...
Tuberculosis, . . .	21	...	15	6	...
Anæmia, . . .	32	20	8	4	...
Scurvy, . . .	3	1	2	...	...
Pleurisy and emphysema, . . .	6	...	5	...	1
Chronic gastric catarrh, . . .	15	11	2	2	...
Total, . . .	333	150	121	60	2

The physician who sent the report for 1875 to the War Office in St Petersburg says: "The beneficent action of koumiss upon some patients was observed towards the end of the first week of treatment; the invalids looked brighter; bolder, happier; the complexion improved; the pale lips assumed a scarlet tinge; the appetite increased rapidly, the muscles grew stronger; and the body gained in weight. The spirits rose with the improved state of the body; the invalids joked, laughed, joined in all manner of field-games, and struck up many a lively

song of an evening."¹ Further, he adds, that "if slight increase in weight rarely served as a trustworthy sign of returning health, a gain of from 9 lb. upwards was always to be relied upon as proof of at least temporary recovery.

If we take the sum total of the tables above quoted, we shall find that during six years 993 privates and officers underwent the koumiss cure in the Government of Samara: of the 993 cases, 551 were cured; 314 improved more or less; while in 128 there was either no change, or a falling off, or death. 866 of these 993 invalids suffered from affections of the lungs or respiratory tract. In the 660 cases where the weight was correctly ascertained, there was a gain, on an average, at the end of the cure, for each patient, of $8\frac{1}{2}$ lb. avoirdupois.

These figures speak for themselves. They are still more instructive, however, if it be added that few of the invalids drank of koumiss more than six weeks; and further, that (in my opinion, at any rate) the locality in which the military barracks and tents are pitched near Samara has been ill-chosen. There is one great and unavoidable shortcoming, however, in

¹ Unpublished report "On the Koumiss Cure in the Samara District, for 1875," presented to the Russian War Office. (Paper 6656.)

the list just quoted, as well as in those of Drs Nef-tel and Zeeland, and it is the following: We have merely a record of the effects of the koumiss cure during the time of treatment, or shortly after it has been undergone. Nothing, so far as I am aware, is known, or has been published, in regard to their later history and the final results of treatment.

Dr Polubensky, however, has, in private practice, been able to trace the histories of twelve cases, which he first saw in the second stage of phthisis, to the end. He had watched forty cases (in the stage of softening) in all; in the majority of them "the disease was arrested for a couple of years by the use of fermented mare's milk." "I met these patients," he continued, "at the koumiss establishments during succeeding years, and was each time convinced of the improvement that had taken place in the subjective symptoms, while the objective seemed no worse. Of the forty patients in this period of the disease, the further history of twelve only was known to me. One invalid, although he felt considerably better during treatment in the steppes, died seven months afterwards. Another, where the malady assumed an acute form, died in four months. A third, who left his bed to undergo the koumiss cure, and in every part of whose lungs humid crepitation could

be detected, lived eleven months. Two others I met at the koumiss establishment a year after, and found that the state of their health had not changed. Renewed trial of fermented mare's milk very greatly improved the subjective symptoms, however; the further progress of their disease I am unacquainted with. Three I saw at the koumiss cure two years subsequently: the disease had advanced somewhat, and two of them died within the same year; one is still alive, but I have no information as to the progress of his malady. The other five are alive to this day — *i.e.*, three years after the commencement of softening in their lungs. Their health is, comparatively speaking, good, but they have also carefully availed themselves of the koumiss cure every summer. The tubercular infiltration, moreover, was not extensive, while the softening process was confined to a limited area.”¹

Thus of Dr Polubensky's twelve cases, the final history of ten only was known to him.

I have myself, within the last ten years, come across twenty-five cases of phthisis pulmonalis, treated by koumiss, with the histories of which I am acquainted from the period of the commence-

¹ Военно-Медицинскій Журналъ.—Ноябрь 1865 г.
Military Medical Journal, Nov. 1865, p. 33.

ment of their illness to within a few months of the time of writing this work. I by no means desire to say that I have watched the disease in every instance from the beginning, and that the invalids have been regularly examined by me during the somewhat long course of their malady. The information I do possess in regard to these cases is the following: I have carefully examined the chest, on one or more occasions, of every person referred to in the table; I have questioned the patients in regard to their previous history and the progress of their disease; and I am able to point out, in nearly every instance, whether the individual is at present dead or alive,—and if alive, as to the state of his or her general health. I shall also, later on, select and give the detailed history of such cases from the table as have proved of more than ordinary interest, or may serve to illustrate certain points connected with the koumiss cure.

[TABLE

TABLE OF TWENTY-FIVE CASES OF PULMONARY CONSUMPTION TREATED WITH KOUMISS, INCLUDING THE RESULTS OF THE TREATMENT.

Patient's number and initials.	Diagnosis: Pulmonary consumption in—	Number of years since the patient commenced the koumiss cure.	Number of times the patient visited the steppes, and underwent the koumiss cure.	Gain in weight in lb. avoirdupois.	Result.
I. Mr S. Y.,	2d stage.	17	2	17 and 18	Perfect recovery.
II. Mr S.,	2d "	5 ¹	2	16 and 15	Death.
III. Mr J. R.,	2d stage and syphilis.	5	2	12 and 10	Great improvement.
IV. Dr L.,	2d stage.	7	4	13 and 8	Great improvement.
V. Dr B.,	2d "	16	5	12 and 17	Perfect recovery.
VI. Miss I.,	3d "	3	3	7 and 17	Death.
VII. Mr R.,	2d "	7	6	15 and 10	Recovery.
VIII. Mr Z. Y.,	2d "	7	5	14 and 12	Perfect recovery.
IX. Mr U.,	2d "	11	3	9 and 10	Great improvement.
X. Miss G.,	1st "	6	4	Considerable.	Recovery.
XI. Miss V.,	1st "	10	2	10	Death.
XII. Mr V.,	1st "	11	2	14	Perfect recovery.
XIII. Miss S.,	2d "	8	1	11	Death.
XIV. Mrs L. S.,	3d "	3	3	9	Recovery.
XV. Mr O.,	2d "	4	2	23 $\frac{1}{2}$ and 15	Perfect recovery.
XVI. Mr M.,	2d "	11	2	Great gain.	Death.
XVII. Miss A.,	3d "	3	2	7 $\frac{1}{2}$	Perfect recovery.
XVIII. Mr Y.,	2d "	9	1	Gained.	Death.
XIX. Mrs T.,	3d "	1	1	8	Perfect recovery.
XX. Mr P.,	2d "	5	1	14 $\frac{1}{2}$	Death.
XXI. Mr T.,	2d "	3	2	14 $\frac{1}{2}$	Perfect recovery.
XXII. Mr K. T.,	3d "	8	1	13 $\frac{1}{2}$	Recovery?
XXIII. Mrs A.,	2d "	1 $\frac{1}{2}$	1	14 $\frac{1}{2}$	Death?
XXIV. Mr V.,	3d "	1 $\frac{1}{2}$	1	Loss.	Death?
XXV. Mr N.,	3d "	1	1	Loss.	Death.

¹ Figures printed in ordinary characters show that the patient is still living; in black letters, the number of years he or she lived after the koumiss cure.

In analysing the above table, it will be found that the twenty-five patients can be conveniently divided, in so far as the results of treatment are concerned, into five groups. To the first group must be referred Cases Nos. I., V., VIII., XII., XVI., XVIII., XX., XV., and X. (nine in all), where there was great gain in weight, permanent improvement or recovery, and an ability to continue, up to the present time, the usual avocations. The second group—Nos. IV., III., VII., IX., XXII. (five in all)—includes those cases where, although the increase of weight has been considerable, the patients are still in a precarious condition—a condition necessitating occasional journeys to the steppes. To the third group belong those Cases—Nos. II., VI., VII., XI., XIII., XIV., and XXI. (seven in all)—where great improvement in regard to physical signs, subjective symptoms, and weight took place after one or more seasons of the koumiss cure, and where the patients' lives were very considerably prolonged, but where they perished of the disease ultimately. In the fourth group must be classed invalids Nos. XIX. and XXIII., who fairly improved during summer while they drank the koumiss, but died the following winter. The fifth group is represented by two patients—XXIV. and XXV.—who hardly drank any koumiss, did not improve

in the least, and died soon after their arrival in the steppes. Of course it would be absurd to attempt to extract statistical data from so limited a number of cases, yet in looking over the table, meagre as it is, there are certain points that strike one somewhat forcibly. Thus we find that while eleven out of twenty-five consumptive patients died within a period varying from one to ten years, there are fourteen still alive, and of these fourteen, thirteen have been living five years and upwards. Of the thirteen cases, again, there are five whom phthisis attacked as far back as from ten to seventeen years ago.

Now the average life of the twenty-five cases of consumption (including even Nos. XXIV. and XXV., who were simply sent to the steppes to die) treated on one or more occasions by koumiss, and shown in the above table, is, at the present moment, $6\frac{1}{2}$ years. Of course, the average will really be higher, as fourteen of the twenty-five are still alive, and may live on for many years more. But even taking the average of life among the eleven who perished of consumption, we find it was no less than $3\frac{1}{4}$ th years. The average gain in weight, which ranged from 7 lb. to $23\frac{1}{2}$ lb., was $11\frac{1}{11}$ ths of a lb.¹

¹ It will be observed in the table that two measurements of weight have been placed opposite some patients; this shows the

I very much doubt whether, within the experience of most physicians, the first twenty-five cases of phthisis pulmonalis—cases that could be traced from the time the disease declared itself to its arrest, or to the patient's death—would supply such favourable results unless the koumiss cure, coupled with a residence during the summer months in the steppes, had been resorted to.

Now I am perfectly well aware that in a certain number of cases the most angry form of pulmonary consumption—nay, even acute tuberculosis—may be arrested in its course, and the patient make a temporary, or complete and permanent recovery. Every physician acquainted with chest diseases well knows that instances of phthisis are now and again met with where the breaking up of consolidated lung is arrested, or where a cavity becomes quiescent, or contracts without any treatment having been resorted to, even where the patient has been placed in the most unfavourable conditions for recovery.

increase in weight the first and second years of the koumiss cure. I have omitted referring to the weight in succeeding years, as it would only tend to make the table more complicated. Moreover, several patients, as will be seen later on, while they gained weight in the steppes, continued improving after they had finished the cure. Some, again, were unable or unwilling to ascertain their weight, although firmly convinced that they were gainers.

Such cases are comparatively rare, however, and I should certainly consider him a sanguine physician who, when consulted by the first twenty-five consumptive patients that entered his study, would state his belief, not only in the probability, but in the possibility, that seventeen of them would be alive that day five years, seven of them that day eight years, and five of them that day eleven years, with no apparent reason why these latter should not have even a still longer span of life. Yet this is what the table above referred to does. Thus the five cases last cited are all alive and well at the present moment, and may continue so for the next fifteen or twenty years, or more for that part of it. One objection that may be raised, I can already foresee, and am prepared to answer it. It may be urged that the first twenty-five consumptive patients entering a physician's consulting room are not likely to have the disease in a form as amenable to treatment as the selected few who are sent to the steppes for the koumiss cure. I regret extremely to be obliged to state that the great majority of invalids who try their fortune at the koumiss establishments have not been sent thither by their medical advisers, but have simply heard from some lay friend about fermented mare's milk, and have given it a trial in

the same way that they might have used Holloway's pills, or the medicine of any other prominent quack.

Moreover, it should be remembered that, as a rule, phthisical patients travel to the steppes only after they have resorted to many other remedies in vain. This is clearly discernible in the table. Of the twenty-five cases, three only were in the first stage of consumption, and of these three cases, one had slight but distinct crackles in the supra-spinous fossa near the acromion, and bronchial respiration (not very marked it is true) just above the clavicle, so that I had doubts about referring her malady to the first stage. All the rest were in the second or third stage of the disease. Moreover, several of the twenty-five patients above referred to should never have gone or been sent to the steppes: of two, however, who seemed in an apparently hopeless condition, one lived a couple of years, while the other is living still. These highly favourable results are partly due, I firmly believe, to phthisis pulmonalis being a more chronic disease in Russia than it is in Great Britain, just as, according to all those who have watched its progress in Italy and Spain, it runs its course much more rapidly in Southern Europe than in England. On the other hand, I must admit, that after upwards of sixteen years'

practice in St Petersburg, and after having seen a considerable number of cases of chest disease, I found that few of the patients sent to Soden, Ems, or the Crimea in summer lived to see that season again, while very few survived three years after the disease had declared itself.

With regard to those consumptive patients, however, who wisely repaired to the steppes (sometimes several summers in succession), and drank koumiss there, the average of life is, as has been pointed out, very much higher. Thus of eighteen¹ persons that I am personally acquainted with, who have suffered from phthisis, who resorted to koumiss for its cure, and who are alive and feeling strong at present,—

2 were first attacked by the disease 22 years ago.

1 was	"	"	18	"
1 "	"	"	17	"
1 "	"	"	16	"
2 were	"	"	11	"
1 was	"	"	10	"
1 "	"	"	9	"
1 "	"	"	8	"
3 were	"	"	7	"
1 was	"	"	6	"
3 were	"	"	5	"
1 was	"	"	4	"

¹ I have here cited, besides the fourteen instances in the table, four additional cases—viz., Professors Ovsyannikof's, Leshaft's, and Manassein's, and that of Count R., of St Petersburg, all of whom had suffered from phthisis, and are firmly convinced that they owe

This will give an average, the figure of which will of course annually keep rising, of ten and a half years. Thus more than half (nearly two-thirds, if we take eighteen as the number of convalescents in twenty-nine) of the consumptive patients who have tried the fermented mare's milk treatment, and whose cases are known to me, have had their disease arrested.

Now what I desire to draw particular attention to is that, at the present moment, all these eighteen individuals continue their usual avocations, some even being engaged in the practice of laborious professions. Thus five are medical men (two living on their estates and doing but a limited amount of practice, while three are professors busily engaged in lecturing, writing, teaching, and in the sick ward, the laboratory, and the dissecting-room); one is a professor of chemistry, also busily employed; three are in the military service (the staff, engineers, and coast-guard); two are advocates, of whom one has a

their present state of good health to a timely resort to the koumiss cure in the steppes. I have not included these cases among the twenty-five, as I did not know these gentlemen when there was active mischief in their lungs. Of the fact of their having had consumption there is no doubt, as three of them are medical men, while the physician who attended Count R. gave me the details of his case.

great deal to do ; two are Government functionaries ; two are merchants—one being a manufacturer to boot. To this list must be added an overworked teacher, and a young lady who superintends (or superintended) a large number of small brothers and sisters. One of the eighteen patients, it is true, does nothing, but as he has been brought up to that from his youth, it will be correct to class him among those who have not laid aside their customary occupations.

I must also add that the great majority of these invalids were not cases of a chronic form of pulmonary consumption, that might have done well without the koumiss cure, but that they were all very near death's door,—at any rate in the opinions of their medical advisers, or their friends, or themselves—before they went to the steppes. Moreover, they were not selected cases, and with two of them the physicians in Samara at first refused to have anything to do, so thoroughly beyond hope were they considered.

I shall cite a few instances of the permanent benefit that has accrued to phthisical sufferers from the employment of koumiss, and have all the more confidence in referring to these cases as the subjects are medical men. Thus Dr Ovsyannikof, the Professor of Physiology in the University of St Petersburg,

informed me that two-and-twenty years ago he left Kazan on the Volga, with his lungs and general health in such a hopeless condition that neither he nor his friends ever thought he would return. When, after the, at that time, tedious journey, he at last reached the steppes, his cough and hectic increased, and he was laid up with a fever which kept him delirious for a fortnight, and three weeks on his back. When he at last felt sufficiently strong to think, he remembered that he had come to the steppes for the purpose of drinking koumiss. He asked for some, took kindly to it, and felt its invigorating effects. Before a week had elapsed he was able to move about the room, and stole a look at himself in the glass (a luxury which, for obvious reasons, had been denied him during his illness), and was shocked at his death-like appearance. Three weeks subsequently he was stout and ruddy, and was able to take long walks and rides. The cough, dyspnoea, anorexia, and hectic had left him, and when he returned to Kazan, his friends failed to recognise him. During the last twenty years he has continued in the discharge of his professorial duties, and has enjoyed excellent health. Dr Leshafi, Professor of Practical Anatomy in the Medico-Chirurgical Academy of St Petersburg, also informed me that he

had congestion and softening of one lung, with severe cough and hectic, brought on, eighteen years ago, by excessive work in the dissecting-room. His whole system was breaking up. A trip to, and a couple of months of complete repose in, the steppes, with plenty of koumiss to drink, restored him to health. He has been able to continue, with no intermission except his summer holiday, his very heavy and by no means healthy work ever since.

Dr Manassein, Professor of the Practice of Medicine in the Medico-Chirurgical Academy of St Petersburg, has kindly supplied me with the following history of his own case. "I come of a healthy family," he writes, "and spent my early boyhood in the country. From the age of eleven to sixteen I was placed as boarder, and kept within the four walls of a public school in St Petersburg. The food was not always of the best. In 1857, at the age of sixteen, I entered the Moscow University, where I applied myself too energetically to my studies, never working less than fourteen, and sometimes twenty, hours in the day. Towards the end of 1858, after very hard work in the dissecting-room during the whole session, I gradually commenced losing my strength, and easily felt tired. In the beginning of 1859, I had slight hæmoptysis, which, after a while,

increased greatly in severity, and left me so weak that I could barely move about the room. I cannot recollect whether I had hectic at the time, but the late Professor Inozemtsef found consolidation of the right apex, with humid crackling, and pronounced a highly unfavourable prognosis. I was sent by him to the steppes to undergo the koumiss cure. At the beginning of the treatment I felt so weak that I lay on my bed nearly all day, while towards the end of the season (I commenced drinking koumiss in the middle of May, and finished by the middle of August) I was able to ride for hours together. I drank about ten bottles of koumiss per diem, and spent day and night in the open air. I did no work, and slept a great deal. The cough left me soon after my arrival in the steppes. Since then I have never suffered from my chest, although I had typhus fever in 1862, and slight febricula in 1878 and 1880. Dulness on percussion above and below the right clavicle, and above the spine of the scapula, with coarse respiration still exist; but there are no moist sounds, neither is there any cough. I must further add, that I was so stout and in such high spirits when I returned to Moscow, that my master, Dr Inozemtsef, did not recognise me."

Dr B.'s case (No. V. in the table) is also a very

interesting one. I made his acquaintance in 1871 at Dr Postnikof's establishment, where he was undergoing the koumiss cure, and learned the following particulars regarding his illness. He had been suffering from hectic, emaciation, cough, night-sweats, dyspnœa, and anorexia six years before. In 1865 he repaired to the steppes, and tried koumiss with very satisfactory results. There was not such a very great improvement in his weight—for he only gained 6 lb. during two months—as in his subjective symptoms. On his return home he made an imitation of koumiss by fermenting cow's milk, which he continued drinking all winter, until he gained 12 lb. more, at which weight he has kept since. He has spent every summer at Dr Postnikof's during the last five years, and always finds himself much stronger after the cure.

A physical examination of his chest in 1871 showed me the following signs:—

Right.—Chest flatter under the clavicle, and shoulder much lower than on other side. Percussion subclavic. somewhat duller than in health, but less dull than on left side. Respiration very weak,—barely audible in fact,—above the clavicle and the spine of the scapula. (Remains of a former vomica?) Vesicular breathing throughout the rest of the lung.

Left. — Percussion dull, and bronchial respiration and bronchophony under and above the clavicle.

After his fifth visit to the steppes in 1871, Dr Postnikof saw him no more. Two years ago (1879), when staying at an inn in Samara, I remarked a person enter the coffee-room who closely resembled Dr B. As he was engaged in serious conversation with two individuals at the time, I did not address him, but afterwards discovered it was he. He left Samara early next morning, however, so that I had not a chance of inquiring about the state of his health. Outwardly he had not changed since I last met him, and his health had probably become quite re-established, as he had not come to the steppes to drink koumiss.

I may as well here refer to the cases of Haeberlein, Bogoyavlensky, Polubensky, and Homenko, all medical men, who left valuable memoirs on fermented mare's milk, and who, having themselves suffered from consumption and visited the steppes for its cure, became sincere believers in, and advocates of koumiss, for the treatment of phthisis and all wasting diseases.

Haeberlein, whose case has already been cited, lived thirteen years ; Polubensky's life, after many years of consumption and many a journey to the

steppes, was not cut off by phthisis, but by typhus fever; Bogoyavlensky and Homenko, for aught I know to the contrary, may be still alive.

Of course it may be remarked that there is no new principle involved in the treatment of phthisis by koumiss; that the use of milk and whisky, or of rum and milk, for the cure of consumption has been resorted to in our Scotch Highlands and in Norway from time immemorial; and that the importance of fermented mare's milk, considered as an article of diet, is not only equalled but surpassed by beef-steak, washed down with eight-guinea ale, or thick slices off a gigot of mutton, with foaming stout to keep them company. Of course, consumptive patients who are able successfully to attack the above-named juicy viands, and nourishing malt liquors, and who can subsequently digest them, will hardly stand in need of koumiss; neither will they require to leave their homes and travel to the steppes.

The unfortunate circumstance, however, is, that in most cases of consumption there is a positive repulsion—a "scunner," to use a more expressive Scotch word—to food; and further, that the stomach of weak persons does not, as a rule, take kindly to too concentrated articles of diet. This is notice-

able even in the pretubercular stage of phthisis, before any physical signs of disease can be detected in the chest, and even prior to the appearance of cough or hectic. Moreover, it should be remembered that a patient no more assimilates all he digests than he digests all he swallows. If dyspepsia or diarrhoea soon follow the ingestion of food, and if the phthisical patient continues falling off instead of improving, in spite of a comparatively good appetite, we may be sure that either digestion or assimilation are at fault, and that waste is in excess of repair.

Now, one of the most remarkable phenomena, as has been pointed out in a preceding chapter, connected with the therapeutic action of koumiss, is that while of itself a highly nourishing article of diet, it does not satiate the patient, but stimulates his desire for other kinds of food. Indeed so rapidly does fermented mare's milk, when taken in large quantities, or when combined with other food, improve the nutrition of the body, and so remarkable are its building-up powers, under even the most unfavourable circumstances for assimilation, that I have seen a consumptive invalid gain largely in weight while the disease was making rapid progress in her lungs, and the evening temperature rarely fell below 101° Fahr. Until then I considered that an increase

in weight in phthisis pulmonalis was a proof of the arrest of the malady, and that breaking up of the pulmonary tissue could never be accompanied by an improvement in the general health or in the subjective symptoms.

Mrs A., *æt.* thirty-four (Case XXIII. in table), applied to me in 1875 for severe hæmoptysis, which first showed itself four years previously. In 1875 the attacks became pretty frequent, the loss being from three to four tablespoonfuls on several occasions in May; as much as six ounces in autumn, and even more than that in winter. Since the spitting of blood in winter she has been troubled with incessant cough; the catamenia remained regular, however; there were no night-sweats, and the appetite was good. On examining the chest, I found the percussion-note dull under both clavicles. On the *left* side there was bronchial respiration over the whole apex, and humid crepitation above and below the clavicle and in the supra-spinous fossa. On the *right* there was bronchial respiration over the whole apex, bronchophony being very decidedly heard over the upper and inner borders of the scapula. I sent her to Samara for the fermented mare's milk cure in the middle of May, and saw her there on the 4th August. She had, during two months, been taking from five to six bottles

of *weak* koumiss (the *medium* made her feel giddy) per day. Her cough had improved greatly, although it still bothered her of a night and of a morning; the dyspnœa had left her; she could take long walks without feeling fatigued; and *she had no return of the spitting of blood*. She had increased in weight 14½ lb. On examining her lungs I found well-marked *cavernous gurgling* below the left clavicle, and amphoric voice and bronchial respiration above the clavicle and in the supra-spinous fossa of the right side. I was called in to see her in St Petersburg in the month of December, when I found signs of laryngeal phthisis, and very great prostration. I saw her no more. From the time that she commenced the koumiss cure up to that date, there was no return of the hæmoptysis.

This is the only case, however, in my experience, where improvement in the general health and a gain in weight accompanied the progressive destruction of lung tissue. I ascribed it entirely to koumiss and the air of the steppes. Dr Walshe, however, in advocating the use of cod-liver oil in consumption, asserts, as his experience, "that weight may increase, the cough and expectoration diminish, night-sweats cease, the strength which had been failing remain stationary under the use of oil, and yet the local

disease be all the while advancing. I have known softenings on a large scale pass in two months into tolerably extensive excavation under these circumstances."¹ Another phenomenon I never witnessed in the course of pulmonary consumption, until I observed its behaviour under the koumiss treatment, was that retrogressive change after humid crepitation (*i.e.*, the sub-crepitant rhonchus) was distinctly audible over a certain part of the lung. In fact, so far as my experience of phthisis in Scotland, England, and Russia is concerned, I never saw the disease arrested where humid crepitation had once fairly set in,—the process of repair or quiescence being apparently attainable in but one manner—viz., the destruction of the softened pulmonary tissue and the formation of a cavity. Of several cases that have come under my notice during the last ten years, where the sub-crepitant rhonchus remained for a long while *in statu quo*, or wholly disappeared, three seem to me as worthy of being recorded in detail, not only because the signs of humid crackling in their lungs underwent retrogressive change, but because their general health seemed quite beyond hope when they undertook the koumiss cure; and lastly, because they all three kept

¹ A Practical Treatise on the Diseases of the Lungs, p. 484. By W. H. Walshe, M.D. Fourth edition. London: 1871.

gaining weight—two of them very considerably—for months after they had finished with the cure. These are cases Nos. I., III., and IX. in the table. Let us begin with—

Case No. I., Colonel S. Y., aged thirty-six, consulted me in February 1874. He had suffered from cough, dyspnoea, hectic, weakness, and emaciation in 1864, for which he drank koumiss in the steppes, and returned home feeling quite well. Since the autumn of 1873, however, his old symptoms are returning. A physical examination of his throat and chest showed the following:—

Hypertrophy of follicular glands of pharynx, and congestion of the whole of the laryngeal mucous membrane. *Right*—respiration weaker than on left side over the whole of the apex. Humid crepitation above the spine of the scapula, and above and just below the clavicle. *Left*—vesicular breathing throughout.

By June 1874 the disease had made considerable progress in the right lung, although the left still continued unattacked. Thus there was distinct dulness on percussion under and above the clavicle, and in the supra-spinous fossa, while humid crepitation was heard over the whole of the scapula, and anteriorly down to the fourth rib. The patient had all the symptoms of phthisis, and found himself growing

weaker from day to day. I advised a journey to the steppes, and a trial of the koumiss cure. After drinking koumiss for a fortnight, he gained 8 lb., and felt himself so much better that he returned to St Petersburg, having been absent but six weeks. His cough, night-sweats, and dyspnœa had entirely left him, and his appetite had become voracious. The physical signs in his chest remained the same. In October 1876 (*i.e.*, two years later) he called on me again, and informed me that he had largely gained in weight since he had been under the koumiss cure; appetite good; no cough; no dyspnœa; physical condition of lungs not altered. I examined his chest last in the spring of 1879, and found the crepitation less loud and partaking more of a dry character, while posteriorly it occupied the upper half of the scapula only. Respiration throughout the rest of the lung was weak. Patient feels perfectly well, and has gained 54 lb. in weight since 1874. I met him in the street a few months ago; he is a broad, powerful, burly man.

What is remarkable in this case, is the wonderful improvement in the general health and nutrition, without a corresponding improvement in the physical signs.

Case No. III., Mr J. R., *æt.* twenty-three (lost

an uncle on father's side and an aunt on mother's from phthisis), of scrofulous habit, with syphilitic pereostitis and induration of several glands, had humid crepitation in the apices of both lungs. Hectic morning and evening, with the temperature never lower than 100° Fahr., and often rising to 103° Fahr. Great emaciation, anorexia, and total loss of strength. I advised a trial of koumiss, but expressed considerable doubt to his relatives as to its success in such a case. I saw the patient in the steppes after he had been there for about a month, drinking five bottles of fermented mare's milk a-day. He had not improved much; the physical signs were the same; hectic was still high of an evening; the cough was considerably better, however, and his appetite was fair. I still considered his case hopeless, and was incautious enough to express an opinion to that effect. He left Samara, after two months' treatment, 10 lb. heavier, but with no arrest of his disease. The hectic left him in winter, however, and he lost little of the 10 lb. he had gained. Next spring he considered himself strong enough to marry, but the year after that, in 1878, he was again obliged to travel to the steppes, and drink koumiss there. The second time he improved more than the first, coarse respiration replacing the sub-crepitant rhonchus in one lung. Although

in weak health he is still alive—*i.e.*, five years after he commenced the fermented mare's milk treatment—and is able to accomplish a great deal of office work, and to support his wife and child.

Case No. IX. is the most striking I have seen of the remarkable therapeutical effects of koumiss in consumption. Colonel U., *æt.* thirty, consulted the late Professor Traube of Berlin in 1869, who found "pneumonia caseosa" in the apex of his right lung, and sent him to Reichenhall. He felt no better from the treatment, and grew rapidly worse in winter. There were cough, hæmoptysis, night-sweats, and great emaciation. In the summer of 1870 he came to Dr Postnikof's, who confirmed Dr Traube's diagnosis of the preceding year. Under the koumiss treatment the invalid rapidly improved,—the dyspnœa, cough, night-sweats, and hæmoptysis soon disappearing. He gained 9 lb. in weight, and 5 lb. more four months after he had left the steppes. Towards spring he again became rapidly worse, and again tried fermented mare's milk at Dr Postnikof's, and again improved much in weight, but during an attack of urticaria, the fever of which ran very high, and continued for a week, he lost 9 lb. On examining his chest, I found very slight dulness on percussion under the left clavicle, and humid crack-

ling from the third rib upwards anteriorly, and from the apex to an inch below the scapular spine posteriorly. He has no dyspnoea, his appetite is good, and he coughs, with slight expectoration, only of a morning. In reply to his inquiry, I advised him to spend the winter abroad if possible, or else to exchange (he was in a dragoon regiment quartered in the north of Russia) for some regiment in the south. He received an appointment as chief of the coast-guard in the Crimea, where he has permanently resided since 1872. In February 1875 he consulted me again. I found cavernous gurgling an inch to the left of the left nipple, and humid crepitation in the apex of the same lung. Patient had not been to the steppes since 1871. I counselled him to try koumiss again, which he did, with the result that he gained 10 lb., and increased other 5 lb. in Constantinople, where he spent the month of August.

I saw him again in the spring of 1876. The cavernous gurgling was still audible, but the subcrepitant rhonchi were heard *near the shoulder only*, instead of the whole apex. He had not lost the 15 lb. he had gained the preceding year, and felt perfectly well. He had no hæmoptysis in the autumn of 1875, although he had suffered from it two previous autumns,—to the extent of an ounce and

upwards—for several days running. He is still alive, and, from what I hear, in good health, and continues at his post, which necessitates, among other duties, a ride round the whole of the Crimean coast twice yearly.

What is remarkable about this case, is not only that the humid crepitation remained stationary during a long while, but that a portion of the lung broke up, forming a cavity, and that the rest of the softened pulmonary tissue afterwards underwent retrogressive change.

I may here add that I met a gentleman at Dr Postnikof's in 1879, who had been there eleven years previously, and who revisited the steppes, not for himself, as he was quite well, but to accompany his son—a sufferer from consumption. Dr Postnikof informed me that when the patient first came to Samara, he had sub-crepitant rhonchi in both apices, and dull percussion note under one clavicle. Very feeble respiration was all I could detect over the spot of previously existing humid crepitation. The quondam invalid informed me that he had been twice to the steppes, eleven and ten years previously, and that since his last visit he has enjoyed perfect health.

A very important question connected with the

koumiss cure concerns its employment in cases of phthisis characterised by frequent attacks of hæmoptysis. It is said by some authors that its use should be strenuously avoided where there has been spitting of blood—a symptom which they believe, entirely upon theoretical grounds, it is likely to increase. Before considering this question, however, it will be necessary to devote a few lines to the diseases in which koumiss really does harm, and where its employment is dangerous to the patient. In this inquiry we are greatly assisted by recalling to mind the physiological and therapeutic actions of fermented mare's milk. Thus it would be irrational to prescribe koumiss to a person suffering from plethora, or from a sluggish portal circulation, or from congestion of the brain or liver. It can also only shorten the patient's life when administered in those diseases of the heart where a large quantity of blood is thrown into the right ventricle, or auricle, or venæ cavæ, in consequence of obstructed pulmonary circulation, or of tricuspid insufficiency. Its employment, again, in aneurism—where our object is to impoverish the blood as much as possible, and to reduce the force and frequency of the cardiac contractions—would certainly be attended with the saddest results. Where there is reason to suspect

atheroma, particularly of the larger blood-vessels, koumiss should be given cautiously. In fact, whenever it is our aim to lessen the quantity of the circulating fluid, or whenever we find that fluid too rich, or simply sufficiently rich, for our therapeutic aims, the administration of koumiss could do nothing but harm. In acute or chronic rheumatism it should be carefully avoided, because of the lactic acid it contains, and also in all cases where the urine is already alkaline, or where it is our object to prevent its becoming so. Its employment in pregnancy, according to some physicians, seems contra-indicated, though no explanation of its action in such cases has yet, so far as I am aware, been vouchsafed.

And now with regard to the much-vexed question, as to whether koumiss increases the danger from hæmoptysis among those consumptive patients who were previously subject to spittings of blood. I consider not, and can even cite several cases where hæmoptysis was not only less frequent, but very much smaller in amount when it did occur, during and after the koumiss cure, than it had been anterior to it. Indeed in one case, where the spitting of blood used to be of so alarming a nature that I was frequently called in to arrest it, there was no return of the hæmoptysis during and after the

koumiss treatment. This was Case XXIII. (already cited, when I referred to the circumstance of an improvement in the weight of the patient continuing *pari passu* with the breaking up of the softened lung), which was all the more remarkable, as even with the formation of a cavity, the spitting of blood did not return.

The histories of two other patients I shall give *in extenso*, as they not only serve to illustrate the point under discussion, but are interesting in other particulars.

Mr R., æt. twenty-nine (Case VII.), teacher in a public school, had pneumonia in the left lung in January 1872, and lay for a month in the Moscow clinic. In March of the same year he took a trip down the Volga to Saratov, but his health hardly improved. During a period of two years he had frequent and very dangerous attacks of hæmoptysis. Indeed in 1874 he continued spitting blood for seven weeks consecutively, and was confined to his bed all that time. He had to lie on his right side,—the slightest movement producing a return of the hæmoptysis. This serious attack was in April and May. In June he journeyed to the steppes and spent two months drinking koumiss at Dr Tchambulatoſ's establishment. He took five bottles of weak koumiss per

diem, gained 15 lb., and could dance at the end of the treatment. *He had no hæmoptysis all the time he was undergoing the koumiss cure in 1874.* In 1875 he again travelled to the steppes, and while drinking fermented mare's milk was attacked with spitting of blood to a very serious degree on several occasions. But he soon recovered his strength, and regained, towards the end of the season, more than he had lost (of his previous gain) during the winter. In 1876, 1877, 1878, 1879, and, if I mistake not, 1880, he spent the summer at Dr Tchambulatof's, always making good his winter loss. The last three years he has had no return of the hæmoptysis. He is able to take long walks, to dance, and to work hard at his laborious profession of teacher during ten months in the year. On examining his chest in 1879, I found humid crepitation anteriorly, from the third rib upwards, and posteriorly over the whole of the left lung.

Mr Z. Y. (Case VIII.), *æt.* twenty-six, lost mother from phthisis. Was ill two years during the winters of 1873 and 1874, with cough and dyspnœa. Had severe hæmoptysis on five occasions, each time more than a large cupful. Towards the spring of 1874 he lost his voice; the cough became more severe, and the dyspnœa and weakness increased. While these

symptoms were at their height, the patient was attacked by tertian ague, which left him so weak that the mere exertion of sitting up caused syncope. His throat was then examined by Dr George N. Scott of Moscow, who found cedema of the epiglottis and tubercular ulceration of the vocal chords. In the summer of 1874 he travelled to the steppes, and so feeble was he when placed in the *tarantass*—a vehicle in which the weary traveller can stretch himself out full length—that the coachman, when they arrived at their destination, after a drive of forty-five miles, breathed a sigh of relief, and piously crossing himself observed, “Well, *barin* (sir), I never thought I would get you this length alive.” I made this gentleman’s acquaintance a year afterwards, when he was energetically leading a country-dance. But to return to his case. To his other complaints, dyspepsia was added, just about a fortnight before he left for the steppes. The case, as Dr Tchambulatof informed me, seemed hopeless indeed. However, he placed the invalid upon three tumblerfuls of koumiss a-day, with the result that at the end of two months, twenty-five glasses (*i.e.*, bottles) were consumed every twenty-four hours. The gain in weight was 12½ lb. The voice improved slightly, while the dyspepsia and cough disappeared entirely. He felt

very well the following winter, except for an attack of fever in December. He kept late hours, and took no care of himself, the result of which was, that he returned to the steppes in the summer of 1875 9 lb. lighter than when he left the previous autumn. He rapidly regained 11 lb. An examination of the patient in 1875 showed considerable enlargement of the spleen and liver. (The remains, no doubt, of the ague.) There was dulness on percussion, humid crepitation, and bronchial voice above, and two inches below, the clavicle, and in the supra-spinous fossa on the right side. The respiration was very coarse over the whole lung posteriorly. The breathing was vesicular on the left side. The vocal chords were slightly thickened and congested. When I examined him, the dyspnœa had quite left him, so that he could take long walks, and was able to join in every dance of an evening; his cough was gone, and his digestion and appetite were excellent. His voice, though somewhat husky, is clear and strong enough for him to exercise the calling of an advocate. He visited the steppes five summers in succession, and made a complete recovery. *He was never troubled with hæmoptysis after he commenced the koumiss cure.* His case, moreover, has strongly impressed itself on my mind as the only instance I

ever met with—in a considerably extensive practice of throat affections—of tubercular laryngitis and ulceration being cured.

These cases are simply a few among a good many that I have encountered, and they have all led me to the conclusion that the danger of hæmoptysis is by no means increased by resorting to the koumiss cure. That highly conscientious observer, the late Dr Polubensky, when he wrote about koumiss sixteen years ago, still considered the question *sub judice*, although the facts he brought forward strongly support the opinion that the cure with fermented mare's milk may be undertaken without increasing the danger from hæmoptysis. "According to my observations," writes Polubensky, "of eleven patients that had previously suffered from frequent spittings of blood, six had no return of that symptom after commencing the koumiss cure. Five, who had spent several seasons in the steppes, knew full well that hæmoptysis could not be avoided during treatment, but they saw no danger in it. Experience had taught them that the improved state of their health till the following year was cheaply bought at such a price. Two out of thirty patients were first seized with hæmoptysis during the koumiss cure, but, with the adoption of certain precautions, they persevered with

it, and attained very great improvement in their health. One invalid had twice suffered from very severe spitting of blood before he tried the koumiss, and finding himself in a hopeless condition, placed full belief in the curative powers of fermented milk. His faith was amply rewarded; there was no reappearance of the hæmoptysis, and his health, which was hopeless before he commenced treatment, improved sufficiently under koumiss to enable him to live another year.”¹

Of course while the spitting of blood lasts, and during several succeeding days, the administration of fermented mare's milk would be as inappropriate as that of any other stimulant. Indeed, after a severe attack of hæmoptysis it is best to recommence the employment of koumiss in small doses,—and further, to take particular care that it should be weak koumiss, as the least stimulating of the three kinds.

We have thus seen when koumiss should be avoided, in what diseases it has proved beneficial, and in what maladies, from *a priori* reasoning, it is likely to prove so. Let us now consider how and where it should be drunk, of what quality, and in what quantities.

Koumiss, then, except in cases of severe and un-

¹ *Op. cit.*

controllable vomiting, should never be administered cold, however grateful it may prove to the patient's palate. It should be remembered that its chief use is in pulmonary phthisis, where the consumption of large doses is needed, and where the nearer the temperature of the ingested fluid approaches that of the blood, the sooner and the easier will it be absorbed and digested. Koumiss, therefore, should be taken with the chill off; and the best way of testing its correct temperature for an invalid is the method I have heard Dr Postnikof always recommend to his patients. On immersing the finger into a glass containing koumiss, there should neither be a feeling of cold or warmth communicated to the skin; then the fermented mare's milk is of a temperature agreeable to digestion.

The strong and medium koumiss should, if possible, be bottled,—the weak may be taken straight from the churn or *saba*. It is absolutely necessary to place the fermenting milk into champagne-bottles, as all others are unsafe. I have even known champagne-bottles burst; and last year a patient of mine almost lost his life by a piece of glass from a bottle of koumiss that had exploded in his hand making a large gash in his neck, and nearly cutting open the external carotid artery. Bearing this case and others

in mind, I would strongly advise that every patient be provided with a covering of basket-work, or wire-netting, to place round their bottle of koumiss before using it. It is also important that the cork should not be withdrawn, and that the fermented milk should be allowed to escape through a syphon cork-screw, with a tap to it. This allows of the last portion of koumiss being as brisk and fresh as the first drawn.

In what quantities, it will further be asked, should koumiss be drunk? Of course the very first precaution to be observed is that the quantity should never exceed what the invalid's stomach can easily digest. Koumiss should never lie heavily on the stomach, and the feeling of fulness which is generally experienced after a long draught has been taken, ought to pass off quickly. Supposing, however, that the patient, as happens in the majority of cases, is able to drink large doses of koumiss and to digest them easily, should he, under such circumstances, be limited to the amount he consumes, or ought he rather to be encouraged to take as much as possible? This will depend upon the disease for which the fermented mare's milk has been prescribed. Thus, if it be dyspepsia or any catarrhal state of the intestines, large doses of koumiss are not called for, as its

action in such cases is more that of an alterative and a tonic than a food. In anæmia, I have frequently found moderate doses of fermented mare's milk—*i.e.*, from one bottle to three bottles per day—sufficient, with a good diet, to restore the patient to health. My friend Dr Ebermann informs me that, in those cases of anæmia where the patients are unable to support any preparation of iron, even when drunk as a mineral water straight from the spring, and when the smallest doses produce headache, sleeplessness, and palpitation, koumiss, combined with iron, produces none of these untoward symptoms, and seems to act with the rapidity of a charm.

When we come to a consideration of the dosage of koumiss in pulmonary consumption, however, the case is entirely different. We here not only need the calmative and gently expectorant action of fermented mare's milk on the mucous membranes of the respiratory organs—we not only need improved digestion, absorption, and assimilation—but we are anxious to introduce as much nutritive material as possible into the blood, which material being in excess of the waste for the moment, will help to repair the losses of the past. Every physician who has studied this question outside the physiological laboratory and the easy study chair, is of opinion

that the more koumiss a consumptive patient drinks, the greater will be the improvement in his subjective symptoms, the greater the gain in weight, the more perfect the arrest of the mischief in his lungs, and the more ready will he be to withstand any passing dangers to which sufferers from phthisis are so frequently exposed. It is useless for Dr Boykof to assert at the end of his thesis, as one of the aphorisms he has thought out after experimenting upon a single individual in perfect health, that "*the employment of large doses of koumiss (as many as five bottles daily), is unnecessary, and that it is more rational to give it in smaller quantities.*" The value of Dr Boykof's opinion with regard to any question connected with practical medicine, may be tested by the fact that he ascribes the increase of weight which follows the administration of koumiss, to the presence of *diluted alcohol* in it.¹

¹ *Op. cit.*, p. 77. At page 78 he writes: "It is well known that the employment of spirituous liquors, particularly those that contain alcohol in a considerably diluted state, such as beer, porter, wines, is followed in the majority of cases by increased deposit of fat, and thus improved bodily weight." Thus, according to Dr Boykof, claret is fattening, while the bloated appearance of the beer and porter drinkers has to be ascribed to the spirit these malt liquors contain! Surely it is a melancholy reflection that a retired undertaker like the late Mr Banting, should, eighteen years ago, have had far more correct views in regard to food and diet than some newly fledged M.D.'s possess in our own day!

As a matter of fact, the most generally accepted opinion in regard to the dosage of koumiss in phthisis pulmonalis, is that the larger the quantity a patient consumes, the better, *cæteris paribus*, the results. Those who sip it never do well as a rule—those who drink from five to eighteen bottles per diem improve rapidly.

This leads us to a consideration of the kinds of koumiss that should be employed for the treatment of different diseases, and in this inquiry we shall be assisted by remembering that strong koumiss is constipating in its action, medium is slightly so, weak is neutral, while sweet mare's milk is laxative. It should also not be forgotten that the amount of alcohol and lactic acid increase with the age of the fermented milk.

In phthisis pulmonalis weak koumiss is preferred,—although both the other kinds are frequently used—because the patient is able, as a rule, to drink more of it.¹ When, however, weak koumiss disagrees with the stomach, then medium is resorted to; when medium disagrees, it is replaced by strong. In ulceration of the bowels or stomach, and in all

¹ The late Dr Tchambulatof used weak koumiss, if there had been hæmoptysis previously; medium in other cases of phthisis. Strong koumiss he employed in cases of intestinal catarrh only.

cases of dyspepsia and gastro-intestinal catarrh, on the other hand, strong koumiss is almost invariably employed. Should there be constipation, authorities like Dr Postnikof and Dr Tchambulatof, prefer correcting it by the addition of from half to a whole tumblerful of sweet mare's milk (which soon produces two or three easy stools) to the patient's morning dietary, rather than dispense with the extra alcohol and lactic acid of strong koumiss. Indeed, where it is desirable to produce the tonic or alterative action of fermented mare's milk, the strong is to be preferred; whereas when our object is to produce its nutritive effects, the weak or medium is employed. Medium koumiss, however, seems best to suit the majority of consumptive and anæmic patients, and more of it, I believe, is used at the koumiss establishments than of the two others put together. As a rule, moreover, an invalid drinks less of strong koumiss than of medium, and less of medium than of weak.

I shall now have to touch upon controversial ground—viz., *where* and *when* koumiss should be drunk. With this question the subjects of pasture and climate are intimately associated. Let me, firstly, elucidate those points, however, upon which medical opinion is almost unanimous. It is gen-

erally admitted, then, that fermented mare's milk may, and does, prove useful, even when that milk is procured from animals (those of the steppe breed being selected) which have been fed on ordinary pasture, and not on the grasses of the steppes. What the believers in the steppe herbage assert, however, is that food greatly influences the quality of the milk,—a point which has been proved by direct chemical experiment in regard to cow's milk,—and that koumiss prepared from the milk of mares which have had access only to a non-specific pasturage—if I may use the expression—cannot possess the same qualities as koumiss made of a milk procured from the same animals when fed on the *Stipa pennata*, the *Triticum repens*, &c. Dr Stahlberg, however, denies the influence of pasture on milk; but as this point has already been discussed in a former chapter—where I have brought facts to prove that even in the steppes themselves, it is quite easy, by allowing the mares to feed upon too rich grasses, to procure a milk totally unfit for fermentation—it need not be touched upon again. Further, it is well known that the quality of the milk given by the same animals, and fed on the same pasture in the steppes, varies considerably with the season of the year,—it being richer in fat, but poorer

in sugar, in the spring and autumn ; while in June and July it contains a larger quantity of sugar,¹ and a smaller amount of fat.

The debatable question, therefore, narrows itself to this : is the difference between the milk of a mare fed on steppe grasses, and of one fed on the ordinary European pasturage, sufficiently great to have any appreciable influence on the therapeutic action of that milk when fermented ? I believe not ; just as I consider it immaterial, when the stimulant effects of alcohol are needed, in what shape we administer it—whether as brandy, whisky, rum, sherry, or port. So with regard to koumiss : it is not for the sake of the aromatic ethereal oil which characterises its smell when prepared in the steppes that we use it, but for the sake of the lactic acid, the alcohol, and the highly digestible state of its casein,—constituents which, certain precautions being taken, remain much about the same in whatever part of Europe the mares are fed.

What speaks much stronger than any arguments I may make use of in favour of koumiss having proved a highly important therapeutic agent, even

¹ Dr Zeeland found 36 parts of sugar in 1000, when he analysed mare's milk in spring, and as much as 70 parts in 1000 in summer. —*Op. cit.* (4861), p. 1151.

when prepared far away from the steppes, are the many cases recorded of its successful employment in St Petersburg, Moscow, and Vienna.¹ I have myself known several invalids upon whom koumiss had been tried in St Petersburg and Tsarskoe Selo with the happiest results.

I would by no means have it understood, however, that I consider it immaterial whether a patient drinks koumiss in the steppes or elsewhere. On the contrary, I am fully convinced that in the treatment of pulmonary consumption, of diseases of the respiratory organs in general, and of albuminuria, by fermented mare's milk, the cure should be carried out in the steppes of South-eastern Russia, and only at certain seasons of the year; for climate plays a highly important part in combating these affections, and assists the action of koumiss in a twofold manner, as will presently be shown.

Before considering how it does so, however, it will be necessary to make a brief survey of the climate

¹ A very interesting discussion took place at the Vienna Medical Society, an account of which was published in the 'Wiener Medicinische Presse,' of the 23d March 1873, regarding the action of koumiss. Drs Schnitzler, Fleischmann, Pleischl, and Ehrman cited their personal experiences of its employment, and all gave highly favourable accounts of its action. They used fermented mare's milk, prepared by Dr Stahlberg from the milk of steppe mares brought with him from Russia.

of South-eastern Russia, and of the fertile plains of South-western and Central Asia, and to point out in what respects the summer in the steppes differs from the summer in Great Britain, and the whole of the European continent. This is all the more necessary, as certain authors, and among them one of the greatest authorities on koumiss, the late Dr Polubensky, have questioned the value of the steppe climate in influencing the progress of pulmonary consumption.

Now the steppes of Samara, and particularly those of Orenbourg and the Tourguy district of South-western Asia, present an essentially Continental climate, in so far, at any rate, as the summer is concerned. The sky, from the beginning of June to the end of September, is almost invariably clear; the days are extremely hot, the nights somewhat chilly. The air is soft and remarkably dry, while a slight breeze always keeps playing over the slightly undulating treeless ground, and carries with it the sweet aroma of the steppe herbs and flowers that cover the broad and almost boundless plains. And what particularly distinguishes the climate of the steppes in summer from that of the whole of the rest of Europe, is the complete absence of dewfall at sunset. Many a phthisical invalid who has spent a summer in Spain, Italy, or the Balkan peninsula,

has been astonished to find that the chill which in these countries crept over him, if he was out in the open air, immediately after sunset (a chill which did not spare even his healthy companions), never troubled him in the steppes. The grass, in fact, is as dry in the steppes several hours after sunset as it is during the day ; while the dew commences falling thickly, and the air feels very fresh, and even chilly, only about an hour or two before sunrise.

Now the steppe air in summer has a wonderfully soothing effect on the mucous membrane of the respiratory passages ; so that the absence of anything like troublesome cough among phthisical patients undergoing the koumiss cure must be ascribed as much to what they inhale as to what they swallow. Of the beneficent action of the climate of the steppes on the lungs, we have excellent proof in the fact that pulmonary consumption is a disease almost unknown in the steppes. Dr Ucke, in his excellent work on 'The Climate and Diseases of the Town of Samara,' has shown this clearly, even in regard to a city with upwards of 60,000 inhabitants;¹ while Dr Neftel observes that he found neither scrofula, rickets, nor consumption among the Khirgiz. He

¹ This is the population of Samara at present ; when Dr Ucke's book was published (in 1854) it was considerably less.

paid particular attention as to whether there was phthisis. He saw hundreds of Khirgiz daily, and was consulted by many, yet he never found any of them consumptive.¹

Prince Alexander P. Uchtomsky, who, during four years, was surgeon of the Semipalatine Government of Central Asia, informed me that, although his district contained a population of 120,000 Khirgiz, all of whom appeared ready to avail themselves of his

¹ This absence of phthisis in the steppes, Dr Neftel ascribes to the koumiss the nomads drink. I consider, however, that the climate is fully as deserving of credit for warding off consumption as the koumiss is,—firstly, because koumiss, to a very large number of nomads, is an article of luxury rather than food; and secondly, because during four or five months in the year they are at starvation-point, and without a drop of fermented or any other kind of milk to drink. As an example of the simplicity of their fare, I may state that last year I was present at the wedding of a very rich Khirgiz. While about thirty favoured guests, seated in the large *kibitkas* or felt tents, were regaled with tea, buns, comfits, nuts, roast mutton, stewed foal, and the king of steppe beverages koumiss, a hundred and sixty horsemen and horsewomen of the poorer class, who had ridden from forty to seventy miles to the feast, were entertained with boiled or stewed (I could not make out which) horse-flesh, of an extremely dry texture, cut up in enormous pieces, and thrown into large wooden bowls. On the bare ground, round each bowl, from six to ten Khirgiz were seated cross-legged, and proceeding on the principle that fingers were made before forks, kept tearing and cutting away the, to them, savoury morsels from the bone, and then chewed them with unfeigned gusto. If dry meat, with nothing save water to wash it down, could be attacked with such readiness in summer, what must the diet be in winter!

services, particularly when their disease was of a chronic nature, he only saw a few cases of consumption among them. It would be idle to deny the influence of climate after the evidence of such authorities. Dr Stahlberg, however, resorts to a peculiar and certainly novel manner of proving that the climate of the steppes is worse, and the temperature lower, than in Moscow.¹ He takes the average annual temperature, and, after showing that it is higher in Moscow than in the steppes, finds no difficulty in jumping at the conclusion that, *ergo*, the summer is colder in the steppes.

Dr Landowsky's arguments are less puerile, for he evidently knows nothing of the steppes—of which Dr Stahlberg has had the opportunity of learning something from hearsay, at any rate—although he errs sadly when asserting that “koumiss, without the boundaries of Russia, gives the same results as in that country; while the temperature and mild climate of France, by being superior to the climate of the *Khirgiz steppes*, adds one more condition for the perfect action of this remedy.”²

¹ When Dr Stahlberg brought forward these arguments he was the proprietor or manager of a koumiss establishment in the vicinity of Moscow.

² Journal de Thérapentique, 1875.

We shall presently consider the question as to where koumiss gives the best results. With regard to climate—unless Dr Landowsky refers to the winter and spring seasons—it is superior in the steppes to that of any part of France, if warmth and equability are to be considered proofs of superiority. In fact, the temperature during the months of June, July, and August is not only higher in the steppes than in France, but the air is balmy and drier,—in other words, the climate is a more purely Continental one. Thus it is by no means uncommon for the thermometer to stand for days and days together in Orenbourg at from 100° to 110° Fahr. in the shade; and one rarely experiences those changes in the weather—although they do, of course, occasionally occur—that are often observed even in Southern Europe. The assertion of Dr Polubensky, who had the opportunity of knowing better, that the weather is more changeable and colder in Samara and Orenbourg than in St Petersburg or Moscow, is simply incorrect. The nights may be, and probably are, colder; but the days, from the commencement of May to the middle of October, are, as a rule, extremely hot.

It is also strange to find as great an authority as Dr Zeeland ascribing the absence of phthisis among

the Bashkirs and Khirgiz, as compared with its prevalence among the Russian peasantry, to differences of race, and to the former living in a more primitive condition than the latter. The first of these arguments has been well answered, or rather anticipated, by Dr Ucke in regard to the death-rate of the town of Samara, where, with a population exclusively Russian, the mortality from phthisis is *extremely low* compared with other cities on the Volga. Concerning the second, it must not be forgotten that the conditions of life of the Russian peasant are as primitive as those of the nomad, except that the former is better provided against the inclemencies of the weather in winter, and has a more regular supply of food—conditions which surely do not predispose to phthisis.

In so far as my own observations extend, I consider it absolutely necessary that the koumiss cure in consumption should be associated with a residence of from two to three summer months at least in the steppes. This is essential, not only because of the calmative effect of the soft and balmy air of the steppes upon the diseased lung, but because of the extreme heat of the atmosphere during the day producing great thirst, and enabling the patient to consume fermented mare's milk in such large quan-

tities as to excite the wonder of those who have only partaken of it in the "stern, cold north." The state of the weather, or rather its temperature, has such a decided effect on the quantity of koumiss consumed, that the preparation of fermented mare's milk at the regular establishments is reduced from 10 to 50 per cent when there is a sudden fall of the thermometer. Patients who can easily consume ten bottles on a hot day, are often barely able to drink five when the weather is cool. Now, at the koumiss establishments in the steppes, five bottles are prepared on an average for each invalid when the day is warm. The quantity consumed varies greatly, of course, some invalids barely being able to drink a couple of bottles in the twenty-four hours, while others reach as high a figure as eighteen. A sudden change in the weather towards cold, however, sensibly reduces the consumption of koumiss. Thus Dr Ebermann, who has sacrificed much valuable time and capital in introducing the fermented milk of the steppe mares to the St Petersburg public, and who has succeeded in always having a supply of it at a comparatively low cost, informed me that in the summer months very few of his patients (his establishment is at Tsarskoe Selo, in the vicinity of St Petersburg) are able to exceed three bottles of

koumiss per day, while the majority drink less. Indeed, if I were asked to make an arbitrary division of the koumiss cure in regard to season and locality, I should certainly say that in all cases of phthisis pulmonalis, it is a purely summer cure, and one which must be undergone in the steppes of Russia.¹ In so far, however, as all forms of anæmia are concerned, in affections of the gastro-intestinal track, and even in some cases of albuminuria, I consider that the employment of koumiss, in whatever locality, and at whatever season of the year, is likely to be attended by the happiest results. In all these cases the invalid does not stand in need of large doses of fermented mare's milk; neither is dry and warm weather absolutely necessary—so that he is entirely independent of the climate of the steppes. In all diseases, therefore, excepting phthisis pulmonalis and bronchitis, the employment of fermented mare's milk may be resorted to at the patients' home with as great prospect of success as in the steppes of Samara or Orenbourg, *provided the treatment is systematically carried out.*

The italicised words bring me to the consideration of a highly important part of the subject—viz, the

¹ The days are warm and the sky clear, from the beginning of June to the end of September, in Samara and Orenbourg.

morale or *ethics* of the koumiss cure, if I may so call it. All physicians, myself among the number, who have endeavoured to spread the employment of koumiss in St Petersburg or Moscow, have, I am sorry to acknowledge, met with but very partial success, or, speaking more bluntly, almost complete failure. This is not owing to any defects in the koumiss, for that prepared at Dr Ebermann's establishment, near St Petersburg, is made from steppe mares' milk, and is of excellent quality. In price it is only thrice as dear as in the steppes,¹ so that on the score of cost it cannot be objected to by well-to-do people. Why is it, then, that in a city of 700,000 inhabitants, so little koumiss is consumed? Simply because patients expect something supernatural of fermented mare's milk,—will insist upon regarding it—in spite of the warnings of their physician that it ought to be considered simply in the light of a nourishing food—as a drug that should act like magic. If their symptoms are not immediately relieved, after a trial of a few bottles, they discard the remedy in disgust, and have the assurance to state that they have derived no benefit from it.

¹ Koumiss costs sixpence a bottle in the steppes, and eighteenpence in St Petersburg.

Now, patients who would regard the koumiss treatment as a jest when attempted at home, carry it out in earnest after undertaking a long journey to procure it. It is for this reason that, during the summer months, I frequently advise invalids to travel to Samara or Orenbourg, who might almost as well have been treated at home, except for the fact that at home they would not have drunk koumiss systematically. After a journey of from 800 to 1200 miles—however delightful that journey may be—the patient is determined not to have gone over so much ground in vain, and readily gives fermented mare's milk a fair trial. Indeed, what with the invigorating air of the steppes, what with seeing dozens and dozens of seekers after health like himself drinking koumiss and discovering a life-restorer in the sparkling beverage, what simply with the force of example—many an invalid who had to be coaxed to take a glass of fermented mare's milk at home, is apt to run into the opposite extreme in the steppes, and to swallow larger quantities than are good for him. Indeed, if one listens to the conversation of a knot of *koumissnicks*¹ when they get together of an evening after their day's work (*i.e.*,

¹ A new Russian word, coined to denote those who come to the steppes to drink fermented mare's milk.

the drinking of koumiss) is over, it almost always turns upon the quality of the fermented milk of that day, and the quantity each person has been able to consume—interlarded here and there with the expression of views, as uncompromising as novel, in regard to the therapeutic action of the remedy. There is also a kindly sort of competition goes on among the patients as to who has drunk most that day, and is thus taking rapid strides towards recovery. There being nothing, moreover, in the morning and afternoon at the koumiss establishments to distract the invalids' attention, they are able to devote their time exclusively to the treatment. The drinking of koumiss in fact is, in the great majority of instances, *business*, when practised in the steppes; *play*, when attempted at home.

In recommending a residence in the steppes for the consumptive patient, I would also most emphatically insist upon horseback exercise forming part of the treatment. Riding is rarely practised at the koumiss establishments, however, not because the physicians object to it,—Dr Postnikof and Dr Tchembulatof, on the contrary, recommend it,—but because some of the invalids are lazy, others have a dread of the saddle, while a very large number have a too tender regard for their pockets,

which they come to recruit, along with their health, in the steppes. Thus laziness, fear, or parsimony often stands in the way of an important adjunct to the koumiss cure. Horseback exercise,—considered as trustworthy a specific in consumption, as bark is in ague by Sydenham,—is not only useful because of the gentle exercise it affords to the muscles of the body, but because of its diaphoretic action. Now, the more the rider perspires, the greater will his thirst be, and the greater his thirst, the more koumiss will he be able to drink. I believe the secret why many patients have made such wonderful recoveries, when living in the steppes among the nomads, with nothing but mutton (of excellent quality, but vilely cooked) to eat, and koumiss to drink, simply lies in the fact that they were in the saddle, and breathing the steppe air from morning till night.

Of course the improvement in weight of the consumptive patient will not be as great with, as without, horseback exercise, however much koumiss he may drink; but for that his strength and general health will be infinitely better. Too much stress is laid, as a rule, upon the comparative number of pounds gained, and too little attention paid to testing the extent to which the patient's powers of

endurance have improved. Indeed, if I find a consumptive patient who could barely crawl across the room before he underwent the koumiss cure, able, at its termination, to take walks of from four to six miles without suffering from dyspnoea, or feeling tired, I care little whether he has gained in weight or not. I may here add that it is very important that the invalid drink his koumiss *after*, not *before*, his ride. If he takes it *before*, he will feel a weight at his stomach, and will also be very sleepy; if he drinks it *after*, he will be able, owing to the great thirst that a good ride causes, to take much larger quantities of it, and to enjoy a snooze after he has satisfied his thirst. On awaking he should mount his horse and be off to the steppe again, and on returning should take a long draught of koumiss, as he had done before.

Another and a very great advantage connected with a journey to the steppes consists in the patient being able to lay aside all thoughts of business, literary work, &c., &c., when he undertakes the cure, and in devoting his attention solely to drinking koumiss, riding on horseback, eating and sleeping. Haeberlein insisted on the importance of this nearly eighty years ago. "Maximum utilitatem a potu koumiss habebunt illi, qui eo extra urbem utuntur,

in rure, loco amœno et salubri, *remoti a negotiis, curis, ærumnis desiderii aliisque animi perturbationibus,*"¹ writes Hæberlein, and further continues: "Quibus cœnare placet, non impediuntur ea edere, quæ pro prandio commendavimus. Sed mature decumbere, et primo mane exsurgere, quammaxime oportet. Qui huic præcepto se conformare nequeunt, raro vel lentissime, convalescunt." He concludes by wisely pointing out that "Literati aliique artium literarumque amatores debent ab omni studio quod animum fatigat, temperare atque corporis exercitio, deambulationi sub Jove, somno tranquillo multam temporis partem impendere."² It is also necessary that the patient start on his journey with a cheerful spirit. If he does so, he will find no difficulty in preserving it during his sojourn in the steppes. If he is morose by nature, or misanthropic, or given to gloomy thoughts, he had better stay at home, for his own good, and for that of the sufferers among whom his lot would otherwise have been cast. It is possible that his temper may improve *pari passu* with his general health; but it would be risky taking the road—which, pleasant though it be, is not strewn throughout its whole length with roses—in the chance of being able, at its termination, to

¹ *Op. cit.*, p. 96. (The italics are mine). ² *Op. cit.*, p. 97.

change one's nature: "Cœlum, non animum mutant, qui trans mare currunt." Let the pessimist, therefore, stay at home.

I have hitherto, however, omitted referring to a highly important question in connection with the koumiss cure, and one which has been the cause of considerable controversy—viz., the patient's diet during treatment,—a question which, after all, resolves itself chiefly into what should be avoided. Many of the older writers,—Haeberlein¹ among the number,—prohibited the use of tea, fish, coffee, vegetables, fruit, &c., but most modern authorities are agreed that the greater the variety of the invalid's dietary, the more nutriment will he consume. Of course any food or beverage, which, by slaking the patient's thirst, would interfere with his desire for koumiss, must be eschewed. Thus, strawberries, raspberries, water-melons, tea in inordinate quantities, particularly in the forenoon and afternoon, should be carefully avoided. The more meat the patient eats during the koumiss cure the sooner will improvement follow, and the more lasting will it be.

Of course in cases of dyspepsia and gastric catarrh we shall have to be extremely careful in regard

¹ "Vulgares tepidi potus; coffea, thea, potus de cacao, evitandi."

to the food, as well as the strength and quantity of the koumiss, we allow the patient.

And now, with regard to another question which concerns the remote action of fermented mare's milk as an article of diet. May not the effects of koumiss, it has been suggested, since it alters digestion, be felt months and even years after the patient has left off taking it, and thus prove *indirectly* beneficial in phthisis, as it is *directly* in dyspepsia? From what I have seen of its action in consumption, I would have no hesitation in replying in the affirmative. Thus Cases I., III., V., VI., IX., and XX. (in the table) continued gaining weight long after they had finished drinking koumiss—No. I. having increased 54 lb. during a period of several years. But even supposing that with the aid of koumiss the patient gets supplied in summer with a stock of internal fuel, just sufficient to enable him to weather the winter waste,—(caused by new deposits or inflammations in the pulmonary tissue, and by the accompanying hectic),—is that not of itself an enormous gain? It is a very great gain in this respect, that by slowing the course of phthisis we are often able thereby to arrest it in the long-run.

What cases of consumption, it is also frequently asked, should not be sent to the steppes for the

koumiss cure, as being very unlikely to be benefited by it? When the disease is too advanced, in so far as the *amount* or *area* of the lung-tissue involved is concerned, or whenever there are no exacerbations of the hectic, and the morning temperature is but slightly lower than the evening—in other words, when there are signs of acute tuberculosis setting in—it is best, in the great majority of instances, to allow the consumptive sufferer to die at home.

Of course I have known some remarkable exceptions to this rule. Thus Cases I., II., V., and IX., have contrived to live many years in good average health, with considerable portions of one or both lungs destroyed; while two cases (Nos. VI. and XX.), the histories of which I shall now relate in full, afford excellent proof, that even in acute tuberculosis we need not always despair.

Miss T., *æt.* nineteen, from Astrachan, had lost a brother and a sister of galloping consumption, although both parents were in good health. She was seized with severe hæmoptysis in the autumn of 1873. During the whole of the succeeding winter she had hectic, night-sweats, severe cough, dyspnœa, and frequent spittings of blood, to the extent of a cupful each time. By the spring of 1874 she was unable to leave her bed; and at a consultation where

several physicians were present it was decided, and quite rightly too, that it would be best to allow her to pass the few remaining days of her life in the midst of her family. An old practitioner who was at the consultation, mumbled something to the effect that koumiss sometimes worked wonders, and that it might be tried in her case. The patient overheard him, and insisted, contrary to the advice of parents, friends, and the majority of her medical advisers, upon being conveyed to the steppes. Her temperature during the whole of winter and spring had never stood lower than 102° Fahr., and rose, towards evening to 104° Fahr., and even sometimes higher. Barely able, even with assistance, to walk across the planks from the pier to the steamboat, she was, on the third day, brought to Dr Postnikof's establishment in the following state: great emaciation, dyspnoea, diarrhoea with streaks of blood in the stools, anorexia; a feeble pulse of 120, and a temperature of 104° Fahr. She had also had several attacks of severe spitting of blood on the way. Dr Postnikof found a large vomica in the left lung, and seeing the hopelessness of the case, counselled the friends to take the invalid back to her home. But weak though she was in body, she had enough strength of will left to carry out her intention, and said that she had come

to the steppes to drink koumiss, and drink it she would. She remained at Dr Postnikof's, who placed her upon small doses of medium koumiss, which she was soon able to drink at the rate of five bottles a-day on an average, from the middle of May until September. By the autumn she had gained 10 lb., and all her symptoms, except slight dyspnoea, had left her. The catamenia, absent two months before she came to the steppes, soon returned after the koumiss cure was commenced. She stayed in Samara during the winter, and by drinking one bottle of koumiss and twelve cupfuls of cow's milk daily, gained 7 lb. additional, so that in May 1875 she was 17 lb. heavier than when brought to the steppes. During winter she took a cold sponge-bath every morning, and walked out in all weathers. In the month of July 1875—*i.e.*, after she had been fourteen months under treatment with fermented mare's milk, I danced a quadrille, a waltz, and a polka with her during a single evening. With the exception of a teaspoonful of blood, brought up in May, she had no return of the hæmoptysis since her arrival in Samara. On examining her chest (July 1875) I found the following signs:—

Right.—Percussion dull under the clavicle; respiration weak but vesicular.

Left.—Percussion duller sub-claviculo than on opposite side ; cavernous gurgling and amphoric voice, both distinctly marked. Humid crepitation over the whole of the rest of the lung anteriorly, and posteriorly, from the middle of the scapula upwards. The respiration was clear only below the inferior angle of the scapula.

I strongly counselled this patient, who consulted me on the matter, to spend the winter and spring in the south of Europe, and to return to Samara for the koumiss cure the following summer. She seemed willing at the time to act upon my advice, but as autumn and winter came round, she preferred staying in Samara, where she had improved so wonderfully the preceding year. An acute attack of tuberculosis set in in February, and I found her in bed in July 1876, with a cavity in each lung. She died in August, or two years and three months after she was brought to the steppes in a moribund state.

The other patient, Professor P. (Case XX.), aged thirty-one (mother dead of phthisis?), I saw in consultation with Dr Gratsiansky on the 22d of May 1876. I learned from him that he had been ill since the autumn of 1875 with weakness, lassitude, anorexia, cough, and dyspnœa ; had had hæmoptysis to

the extent of two table-spoonfuls in February, and the same in March and May. After the last spitting of blood on the 6th of May, severe hectic set in, the evening temperature rising to 104° Fahr., while of a morning it never fell below 101° Fahr. He had been confined to the house nearly two months. An examination of his chest showed the following physical signs :—

Left.—Respiration coarse over the whole of the apex. Below the nipple anteriorly, and from the sixth rib downwards posteriorly, percussion note dull, and humid crepitation and bronchial voice distinctly marked.

Right.—Dulness on percussion, and humid crepitation under and above the clavicle and above the scapular spine. Respiration coarse, with prolonged expiration, and increased vocal resonance over the whole of the rest of the lung.

The question Dr Gratsiansky and I had to decide was, what to do with the patient? The state of his temperature, which had kept steadily high in the mornings as well as the evenings, the thorough anorexia and complete and rapid loss of strength, furnished the strongest reasons for suspecting that acute tuberculosis was present. Moreover, the patient's condition and symptoms as the spring and warm

weather approached, grew very much worse,—a highly unfavourable prognostic sign, so far as my experience goes. Indeed I have never seen a consumptive patient do well, far less recover, if with the advent of warm weather his condition did not show marked signs of improvement. Considering, however, in the case of Professor P., that he was living alone in a noisy street of a dusty city; that the air he would inhale during the hot months of summer could only hurry on the inevitable end; and remembering, further, that the steppes could be reached with but twenty hours of railway travelling (the rest of the journey being accomplishable by steamer), I advised, though with very great misgivings, a trial of koumiss in the government of Samara. Indeed I expressed myself to Dr Gratsiansky, that if the worst came to the worst, it would be better to take one's last breath in the quiet and sweetly-scented steppes, than in an over-crowded, noisy, dusty, city. Dr Gratsiansky agreed with me, and our patient set off for the steppes. About two months later I was unable to recognise him, so stout and jolly-looking had he grown. From the 29th May to the 1st August he had taken five bottles of koumiss on an average per day; he had commenced with the weak and finished with the medium. After a week's residence in the steppes,

the hectic had quite left him, the cough became slight, the dyspnoea improved, while the appetite grew voracious, and continued so for about a fortnight, after which time it became and remained hearty. At the end of two months he could easily walk eight miles in the day, the dyspnoea and cough had quite disappeared, the morning and evening temperature was normal, and the gain in weight $14\frac{1}{2}$ lb.

The physical signs at the beginning of August were as follows:—

Sinistra.—Weak but clearly audible respiration over the whole lung.

Dextra.—Percussion dull below the clavicle. Humid crepitation under and above the clavicle, and in the supra-spinous fossa. Wavy inspiration, and prolonged expiration from the second to the fifth intercostal space anteriorly. Breathing healthy throughout the rest of the lung.

In October—*i.e.*, three months later—the respiration was healthy though weak in both lungs, while humid crackling was audible only above the scapular spine. Dr Tchambulatof and I advised the patient to spend the following winter and spring in Italy, which he did. He is now a strong and powerful man, works in his chemical laboratory from

morning till night, and is able to lecture and discharge the duties connected with his chair. He has had no cause to revisit the steppes.

These last two cases speak for themselves, and need no comment.

I may as well here state, however, that I pay particular attention to the question of heredity when sending patients to the steppes; for I have very much greater faith in the favourable results of the treatment when applied to consumptives who have no hereditary taint, than to those who have lost ancestors by the disease, although the local mischief may be pretty extensive in the lungs of the former, and very limited in those of the latter. I am also not unaware of how difficult it is to procure information on the subject. Many consumptive patients have lost father and mother when they were children, and have no idea of what disease their parents died; while occasionally the malady receives some milder name from the relatives. What I would desire to direct particular attention to, however, is, that we should never fly to the conclusion that because the parents of a phthisical individual are alive and in health, therefore neither of them has ever had consumption. I have on several occasions discovered that a so-called healthy mother or father had in youth been at death's

door from consumption; that many a winter had to be spent abroad; and that, finally, the disease in the lungs was arrested, and the enjoyment of excellent health followed. These serious incidents are often forgotten by patients, particularly after the lapse of many years. It thus often happens that where we suppose phthisis has skipped a generation, it has really done nothing of the kind. The disease, in fact, after roughly handling the individual, and giving him a severe shock, had left him in the possession of an afterwards enjoyable life. I do not, however, consider the prognosis any better in the case of the offspring of a consumptive parent who has survived his trouble than of one who has succumbed to it. Further, I always regard the prognosis as more grave when the patient had lost brother or sister from consumption than when either parent has died of the disease.

I must not omit mentioning that the presence of evening hectic should never prove a reason for discountenancing a trial of koumiss in phthisis. Evening hectic is not of such serious import, and very soon, in the majority of cases, disappears entirely in the steppes. Where there is any laryngeal complication (particularly if there be cedema or ulceration of the epiglottis), no benefit,—in spite of wonderful

exceptions, such as Case VIII.,—is likely to be derived from the koumiss cure. Indeed, if there be any ulcers on the epiglottis, or if it be cedematous, the carbonic dioxide and the lactic acid of the fermented milk only irritate that part.

I have no doubt, however, that some cases of phthisis, and even of tubercular laryngitis, where I strongly objected to the patient's removal to the steppes for the koumiss treatment, might perhaps have recovered or improved so far as to have lived on for many a year. But it is best to adhere to the rule in such instances, and not to be dazzled by a few rare exceptions, however brilliant. Thus, in spite of what I have occasionally witnessed of phthisis being arrested in its worst forms by fermented mare's milk and the air of the steppes, I would not advise any consumptive patient to go far away from home and relatives, unless the chances in his favour were at least equal to those against him.

I suspect, moreover, that the cause of koumiss has suffered considerably by its having been lauded too highly by incautious, impulsive, and not always disinterested champions; while sober people, who perused their gushing reports, have been sadly disappointed when, on applying the test, they discovered

what a broad gap existed between promise and fulfilment.

Thus, while it is amusing to read Dr C. J. W. Williams's solemn statement regarding the failure of koumiss when tried at the Brompton Consumption Hospital¹ (where it could not possibly have succeeded—1st, Because it was not koumiss, but fermented cow's milk that was used; and 2d, because, if it had been the former, it was given in far too small doses), it is lamentable to every believer in the importance of this valuable therapeutic agent to observe Dr Jagielski writing about it in the following strain: "It stimulates digestion without affecting the head—a fact noticed and expressed to me by patients with the utmost satisfaction and joy. Some extolled its peculiar influence on the brain, *it leaving the head clear for brain-work, and generally strengthening memory and intellectual power.*"² (The italics are mine.)

Of course Dr Jagielski refers to the action of fermented cow's milk,—which he wrongly calls kou-

¹ Pulmonary Consumption, by C. J. B. Williams, M.D., and Charles J. W. Williams, M.D.: London, 1871. In a footnote at page 386, Dr C. J. W. Williams says: "We may mention that this drink has been lately tried at the Brompton Hospital on consumptive patients, but that the experiment was not sufficiently successful to warrant its continuance."

² British Medical Journal, February 21, 1874.

miss,—prepared under, or according to, his directions, by one particular firm of druggists in London. As he has, however, voluntarily entered the ranks in which the floaters of Zoedone, Du Barry's Revalenta, and Morrison's Pills, compete for public favour, it would be useless attempting to receive his statements seriously. The action of fermented mare's milk, I need hardly inform the reader, is confined to a much humbler sphere than that of cow's fermented milk, as prepared according to the receipt of Dr Jagielski. The advocates of the former are quite contented to watch its good effects on the body,—leaving "*the strengthening of memory and intellectual power*" to more appropriate and potent remedies.

It must be distinctly understood, then, that the therapeutic remedy and article of diet that has formed the subject of this essay is the fermented milk of the mare, not of any other animal. It is to it that the name of koumiss has been applied from time immemorial, and that name should be reserved exclusively for it in the future.

In conclusion, I may remark that if the consumptive sufferers,—provided there are no objections to their journeying to the steppes,—attend to the rules that have already been laid down for their guidance, they will generally derive great benefit, and in a

very short time, from the koumiss cure,—a benefit they would search for in vain during the summer at any European watering-place. "It would not be overestimating the use of this remedy by foretelling," wrote Dr Karell in 1866, "that, several years hence, patients suffering from consumption, that terrible scourge of humanity, will renounce all thought of a voyage to Madeira, Ems, or Eaux Bonnes, and will travel towards the steppes of Russia in the direction of Orenbourg or Samara, or any similar locality where the best koumiss is prepared."¹

Indeed the experience I have brought away from the steppes, after several sojourns there, has been to the effect that lives which would have lasted but months without the aid of koumiss, are measured by years when it has been resorted to. "Two years of Italy," as, according to Zeeland, an eminent physician of "the northern Palmyra"² once said to a consumptive patient, "or two months of koumiss."

The cure may have to be repeated, however, from year to year, as patients often lose in winter much of what they gained in summer. Moreover, invalids rarely increase as much relatively in weight the second season of the cure as they do the first, simply

¹ Archives Générales de Médecine, 1866.

² The name given by poets to St Petersburg.

because, as a rule, they do not lose all in winter that they made in summer. The rule, in fact, is, that if the patient progresses favourably, each spring finds him heavier than the preceding one.

It should also be remembered, that if most phthisical invalids who have drunk koumiss in summer get worse in winter, it is greatly owing to the bad hygienic conditions in which sufferers from chest complaints are placed in Russia during the cold weather—*i. e.*, from November¹ to May. Thus few of the patients mentioned in the table, spent the winter or spring in Southern Europe (excepting Cases II., IX., XX., and XXII.); while many, had they persevered in the treatment several summers in succession (as Cases IV., V., VII., VIII., and X. wisely did), would probably have been alive now. Case II. illustrates this point admirably, and I shall therefore cite it in full.

Mr S., opera-singer, *æt.* thirty-three (both parents dead of consumption?), applied to me in September 1872, complaining of hoarseness, and a slight, tickling, troublesome cough. During the winter of 1871-

¹ The months of November and December had perhaps better be spent by the phthisical patient in Russia—where the weather is dry, and the houses warm and comfortable—than in the south of Europe, where these two months are the coldest and dampest in the year.

1872 he had suffered severely from cough, dyspnoea, night-sweats, hectic, and loss of voice, so that he was unable during spring to fulfil his engagement at the opera. He was advised to go to the steppes, where he drank koumiss for two months,—felt very much better, and returned to St Petersburg 13½ lb. heavier than he left it. Slight cough and hoarseness still remained, however. I found the mucous membrane of the pharynx, larynx, and vocal chords slightly congested; the breathing was coarse and very loud (almost bronchial) in the apex, and there was a slight friction sound under the inferior angle of the scapula, on the *right side*. Over the *left lung* the percussion was absolutely dull under the inferior angle of the scapula, and anteriorly from the nipple downwards. The respiration was weak at the apex, almost *nil* at the base.

In the month of February 1873, I found—

Right.—Humid crepitation under the spine of the scapula and along its internal border.

Left.—Respiration *nil* all over. Humid crackling audible above the clavicle after energetic coughing and a deep breath. The subjective symptoms, particularly the cough, were very distressing. I advised him to try the south of Europe, so as to avoid the St Petersburg spring,—the worst season of the year

for the consumptive patient. He spent two and a half months in Castellamare near Naples, and returned to Russia in the middle of April, feeling greatly better. The respiration, though extremely feeble, was now audible over the left lung. The right side was in the same condition as before. I counselled a journey to the steppes, whither he repaired in June, spent two months there, drank two hundred bottles of koumiss, and gained 16 lb. in weight. The cough still continued, however, although the expectoration was quite easy, and the voice clear and strong. He was able to resume his professional duties during the winter, sometimes singing four nights a-week. Towards February his health commenced failing again; his voice grew weaker, and dyspnoea returned. Groaning rhonchi were heard over nearly the whole of the scapula. Spent March and April in southern Italy (Palermo, Castellamare, Malta), and returned feeling much better to Russia. The groaning rhonchi over the scapula had disappeared. I advised a repetition of the koumiss cure, from which he had derived so much benefit in former years. He refused to do so, however, as he had accepted a professional engagement for the summer, near St Petersburg. In the autumn he was feeling very much worse; his vocal chords were congested, his cough

severe; breathing and expectoration difficult, and groaning rhonchi were again heard over the right scapula. With rest and treatment, he soon recovered his voice, and again sang during the winter. He would not consent to go abroad in spring or to the steppes in summer, on the old plea that he had again signed an engagement for playing out of town during these seasons. In the winter of that year (1875), I found him in a very wretched condition. His vocal chords were thickened and very much congested; the cough was distressing; the dyspnoea great, and his appetite gone. Amphoric respiration and voice were distinctly audible above and below the clavicle on the left side. I saw no more of the patient, as he neither called on me nor sent for me afterwards. He died early the following winter, having been confined to his bed for several months, and his end having been hastened on by tubercular laryngitis setting in.

Here we have an example of koumiss in summer, and Italy in spring, staying the disease for nearly three years, and of the malady rapidly progressing to a fatal termination when the therapeutic and climatic remedies were dispensed with.

Cases XI. and XII. in the table are also well worthy of notice, as they show how koumiss retards

the progress of consumption in some instances, and arrests it completely in others, even when there is a strong predisposition to the disease in the family. Mr and Miss V., brother and sister, belong to a decidedly unhealthy family. Thus, though both parents are alive and healthy, they have lost, of a family of nine children, a daughter of consumption; an adult son of abscess in the brain (tubercular?); another son has been in bad health, with an affection of the kidneys, if I mistake not, for many years past; while the youngest is now suffering from locomotor ataxy. The brother and sister referred to in the table, both sufferers from phthisis, spent two seasons in the steppes, and drank koumiss at Dr Tchembulatof's. The brother's pulmonary affection was slight, but he was a martyr to catarrh of the intestines, of which he was completely cured the first summer he drank fermented mare's milk, so that the second year he went more for the sake of keeping his sister company than on his own account. The sister improved so much the second season, that she considered it no more necessary to renew her journey to the steppes. Although not in robust health, she lived nine years (ten years after her first journey), and was carried off at last by the disease assuming an acute form, after her exposure to se-

were cold. The brother is still alive and in perfect health.

I never was the medical adviser of these patients, and examined their chests once only, in 1871, in Samara, where their St Petersburg physician was present at the time. I am unable, therefore, to communicate any details.

Perseverance with the koumiss cure is absolutely necessary, in the majority of phthisical cases, if a permanent improvement in the patient's health and an arrest of his disease are contemplated. Dr B. (Case V.), visited the steppes five seasons running, until he completely recovered; Mr R. (Case VII.), six times; while it is worthy of note, that in Dr Tchambulato's highly interesting case of double vomica, adverted to in a previous chapter, the cavity in each lung only healed during the third year of treatment.

There cannot, therefore, be a doubt that the final results of the koumiss cure would be far more favourable than what they are at present, if sufferers from consumption perseveringly visited the steppes for several summers in succession, until their malady was permanently arrested, and all subjective symptoms of the disease ceased.

Is the phthisical invalid, then, it may be inquired,

year after year to repair to the steppes with the object of arresting his malady, or perhaps of only warding off the inevitable end? As that is his only, or at any rate his best chance, I would reply without hesitation, yes.

Moreover, the journey to the steppes, though long, is neither unpleasant nor monotonous. If the patient, when bent on recruiting his failing health, is sufficiently wise to take as much advantage as possible of communication by water, he may, by starting from Leith, Hull, or London, reach the town of Orenbourg—i.e., the borders of south-western Asia—with but thirty-three hours' (and these not consecutive) railway travelling in all.¹ The railways and steamboats in Russia,

¹ Taking the steamer from any of the three ports on the east coast just mentioned (the Hull and Leith boats are the best), the passage to St Petersburg occupies from six to seven days. The weather in the North Sea and Baltic is generally fine during the summer months, so that the appetite, sleep, and spirits of the patient greatly improve on the way. From St Petersburg the journey is half-way by rail to Moscow, and then a turning to the right in the direction of Ribinsk on the Volga. That part of the journey occupies eighteen hours. From Ribinsk you sail by steamer down the Volga (forty-five hours) to Nijni Novgorod. From Nijni Novgorod, the boats are much larger, more comfortable, and faster, so that you travel to Samara in forty-three hours. From Samara to Orenbourg there are fifteen hours' journey by rail. Thus the whole voyage as sketched above, from Great Britain to the heart of the steppes, can be accomplished in thirteen days. It may be shortened, however, by travelling from St Petersburg to Moscow, and thence to Nijni Novgorod by rail. A saving of twenty-nine hours is thus effected. On returning from Orenbourg by rail *via* Samara, Sizran,

moreover, are comfortable and well managed. Most of the carriages are sleeping-cars, while the steamers from Nijni Novgorod to Samara are constructed on the American system—large, wide, and roomy. In going down the Volga, the longest, and, in some parts, the broadest river in Europe, the invalid's eye frequently rests on lovely scenery, while the changes are so frequent that he has no time to weary of what he sees. He sails past the picturesquely situated towns of Ribinsk, Plioss, Kostroma, Yaroslav, and Nijni Novgorod; while for a distance of forty miles before Samara is reached, the river winds its way eastward, with high pine-clad hills protecting it on either side. These are the Jiguliof hills, called the "gateway of the steppes;" and after passing them, the patient breathes a softer and balmier air, and feels that he has left the, so far as climate is concerned, "treacherous North" behind. The weather is warm, clear, and sunny, as a rule; and there is life enough on the river and on its banks, and on the very steamboat by which he travels, to distract the patient's attention, and make the time flit pleasantly by. Thus in the cabin and on deck he will see every class of Russian society, from the rich

Riazan, Moscow, St Petersburg, Berlin, and Flushing, London can easily be reached in from six to seven days.

noble travelling to his broad estates, to the poorest peasant in search of work in the sunny South. The conversation is interesting, lively, and varied; and the passengers are amiable and communicative as a rule. Of an evening the songs of the peasants, as they float down the Volga on their rafts or barges, are wafted across the water to the traveller's ears. The songs are plaintive, as though some long-pent-up sorrow had escaped from the deep, brawny, sun-burnt chest; the melancholy strains are but the echo of a time not long since past, when the chains of serfdom had not yet been broken by the autocratic wand of the emancipator.

The sun, which pours its flood of fiery golden rays upon the river and the pine and birch clad hills before it sets, is soon succeeded by the dark, cloudless, southern night, with bright stars peeping through the canopy of heaven, and contrasting vividly with the surrounding blackness. From the funnel of the steamer, heated by wood, red sparks escape in myriads; they ascend high into the air, and twist and turn like fiery serpents as they slowly fall into the deep-flowing stream. At times a floating three-storeyed castle is seen moving on the river; it is one of the steamboats built on the American plan. Then the varied coloured lights that the ships and

steamers carry shine like gigantic rubies, emeralds, or diamonds against the dark sky, and lend a still greater enchantment to the scene.

On reaching Samara, after several days' delightful journey by water, the patient travels either by train or equipage to the steppes. If the life which awaits him there is somewhat monotonous and dull, he is amply repaid for it by the delightful climate he enjoys. The sky is always bright and the air clear; and if the heat is somewhat severe, it serves the excellent purpose of making the patient drink large quantities of koumiss, and thus ministers indirectly to his cure. But the atmosphere during the hottest day is never oppressive, for there is always a slight breeze playing in the steppes. The nights are cool, moreover, and allow of refreshing sleep. After a few days' residence the invalid gets accustomed to and likes his new life and abode. Indeed there is a peculiar indescribable charm about the steppes. As the traveller mounts his horse and gallops through the high and thick herbage, he feels as though an ocean were before him, so broad and vast and boundless does the undulating, treeless, grassy expanse appear. This sensation is doubly strong with the consumptive patient, who has for months previously been pent up in close rooms and in a smoky city.

The invalid breathes deeply of the soft, velvety air, impregnated with the sweet aroma of the rich grasses of the steppes ; while the gentle breeze which keeps continually sweeping over them softens the fierceness of the sun's rays, and fans the hectic cheek.

The nomad values the sweet-scented herbage highly, not because of the ethereal balm it contains, but as belonging essentially to the steppes. Chief among these aromatic plants is the small wormwood, or *yemshan*, as the natives call it. It is regarded by them with pride and tenderness, as the emblem of the broad, undulating plains they inhabit. For there are steppes without *yemshan*, but the *yemshan* cannot exist without the steppes ; it grows there only. The sweetly-scented little plant, when shown to the nomad in a foreign land, has, it is averred, made the blood dance in his veins, and brought the tear to his eye. So say the Ipatof Chronicles of the twelfth century, and so sings Maykof in his charming poem called "Yemshan." It appears that Sirgan, a nomad chief, sent a messenger to his brother Otrock (who had been defeated by the Russians under Monomach, and had fled to the Caucasus), inviting him to return to his old home in the steppes. Monomach was dead, while Otrock had risen to be leader of one of the Circassian tribes ; and his brother, not thinking

that he would comply with his request, gives the following instructions (which I have taken the liberty of translating from Maykof's poem) to the messenger :—

“ Tell him towards home to bend his track,
For dead's our foe, and fallen our chains ;
Say all you can to woo him back
To his own native, balmy plains.

Should counsels fail, our songs then try.
If they move not his spirit stern,
Some steppe *yemshan* together tie,
And give him it—and he'll return.”

The arguments and entreaties of the messenger are uttered in vain, and even the music of his native songs fails to shake the Circassian chief's resolution not to forsake his adopted country. When, however, the messenger presents a bunch of *yemshan* to Otroch, the latter is unable to master his feelings. The stern chief presses the pale-green leaves of the sweetly-scented plant to his bosom, then kisses them, and bursting into a flood of tears, throws up his new kingdom, and retires to his native balmy steppes.

Of course I by no means pretend to hint that an invalid after the consumption of even very large quantities of koumiss, and a residence of several months in the steppes will feel as warm an attachment to the locality as the nomad warrior just

referred to. Yet, if he has not travelled beyond Europe, he will behold much of what is highly interesting and entirely new in the steppes. If he simply visits the fair in Orenbourg, he will there encounter representatives of every nationality of Central Asia, such as Khirgiz, Khivans, Bokharans, Sarts, Bashkirs, Turcomans, Khokhans, and Jews—men of dignified mien and cunning eye, each dressed in the picturesque garb of his race or country; while long, almost endless caravans of dromedaries, laden with cotton, silks, velvets, carpets, and turquoises, moving across the fertile plains, with their slow but steady pace, present a truly Eastern picture, which carries one's imagination back to the times of Holy Writ. If, further, the invalid prefers returning by the Volga, he will have time to see the famous fair of Nijni Novgorod, and will travel thither in the company of other Asiatic races—viz., Persians, Armenians, and Chinese, whose habits he will have an opportunity of studying on the way; and when, at last, he reaches home in high spirits and re-established health, he will often look back with pleasure on his journey to, and his residence in, the Russian steppes.

APPENDIX.

ON THE FERMENTATION OF COW'S MILK.

It was but natural to expect that those patients who derived benefit from drinking koumiss in the steppes, should have desired to continue the treatment when they got home. As the great majority of them were unable to obtain mare's milk for the purpose, they fixed upon cow's as the easiest procurable, if not the best, substitute. And although several modern physicians and laymen have laboured under the impression that they had made a great discovery in using cow's milk instead of mare's for fermentation, and have not only contented themselves with calling it koumiss, but have actually asserted that it is *better*,¹ because *richer*, than mare's,

¹ Thus Dr Jagielski considers "cow's milk an equally good raw material, if not better than mare's milk, for the preparation

it should be remembered that Dr Pallas, in the last century, speaks of the Tartars fermenting cow's milk when mare's fails them.¹

When skimmed, however, diluted with a certain percentage of water, and with a given quantity of sugar (lactine being preferable) added thereto, cow's milk can be very easily and successfully subjected to fermentation. Of course the process will not alter the chemical nature of the casein, or of the fat of cow's milk, which will continue to differ essentially from mare's. Still, cow's milk, by dilution, abstraction, and addition, may be made closely to resemble mare's in regard to the *quantity*, if not the *quality*, of its component parts. It is, or ought to be, a very cheap² preparation, moreover, for it is skimmed of its cream, and from 25 to 30 per cent of water is added to it before it is subjected to fermentation. Neither is its preparation so very difficult; and in the country, or in small towns, where a supply of

of koumiss" (British Med. Journ., February 21, 1874); while Dr Landowsky regards "the richness of cow's milk as advantageous (when compared with mare's) to the sick, *who absorb a larger quantity of nutritive material*."—(The italics are mine.) Journal de Thérapeutique, 1875, p. 698.

¹ Physikalische Reise durch einige Provinzen des Russischen Reichs.

² The only expensive part is the addition of lactine, which is five times dearer than cane-sugar.

good milk is easily procured, it should be manufactured on the spot.¹

Thus in families where there are several young ladies with plenty of spare time on their hands, the fermentation of milk may be carried out very easily, by each of them taking a turn at the churn-staff for a quarter of an hour or so, four or five times a-day, —a gentle exercise, which would prove a pleasant relief from the weary routine of piano-strumming. I have known several families in Russia where the young ladies made excellent fermented cow's milk, both in town and country, for ailing relatives and neighbours, and for the sick poor; and I think their example could, with advantage, be followed elsewhere.

I shall here cite two recipes for the preparation of fermented cow's milk; the one recommended by

¹ In London, and other large towns, where a supply of good milk is not always procurable, it would, I think, be best, and perhaps as cheap in the long-run, if fermented cow's milk were manufactured on a large scale by some dairy company; for it is no more a necessity that druggists should prepare it, than that they should brew the beer we drink. I was glad to find that the Aylesbury Dairy Company in London has commenced the fermentation of cow's milk on a large scale, and that it is sold by them at a comparatively low price. It is of excellent quality, and will soon, I have no doubt, supersede those preparations of fermented cow's milk, to which the mystery of a nostrum is attached by the makers, and which is as dear as Burgundy.

as great an authority as Dr Polubensky (himself a sufferer from phthisis), who resorted to it with marked benefit during many a winter when he was unable to procure koumiss—the other highly praised by Professor Levshin of Kazan, and communicated to him by Mr Deshovof of St Petersburg.¹

The reader will have to make his choice which of the two processes he will adopt; or he had better, perhaps, give both a trial, and then follow the one he considers best and most practical. Dr Polubensky's directions for fermenting cow's milk, are as follows:—

“An oak churn, such as is used for churning butter, has a bottle of fermented cow's or mare's milk, five days old,² poured into it in the morning. A tumbler and a half of warm milk (of a tempera-

¹ Should the reader be able to procure ass's milk, he may, if the supply is limited, by mixing it with a certain quantity of cow's milk, and then fermenting, obtain an excellent substitute for koumiss. For particulars I would refer him to an admirable little work by Dr B. Schnepf of Eaux Bonnes, entitled 'Traitement efficace par le Galazyme des affections catarrhales, de la phthisie et des consommations en général : ' Paris, 1865.

The author very wisely does not call a fermented mixture of cow's and ass's milk *koumiss* (which it is not), but has coined a new and most appropriate word, which may be applied to all fermenting milks—viz., *galazyme*, derived from two Greek words, γαλα, milk; and ζυμη, a ferment.

² The method of preparing the koumiss will be presently mentioned.

ture of about 90° Fahr.), in which half an ounce of cane, still better milk, sugar has been dissolved, and a bottle of skimmed cow's milk, are then added.

“The addition of the sugar is made for the purpose of remedying the small amount of lactine in cow's milk; the water is added to make the milk, which is rich in casein, thinner, and thus to facilitate its agitation and emulsion. Skim-milk is used because it contains less fat, an excess of which interferes with fermentation. The mixture is then beaten up during half an hour, to prevent the curdling of the casein, and is then laid aside for three hours. (This is effected at an ordinary room temperature of 60° Fahr.) After the lapse of three hours, when the surface of the mixture is covered with a film (of casein and fat, in a non-emulsionised condition), it is again agitated for half an hour, and another bottle of skim-milk—with or without warm water, according to the thickness of the milk—is added; the whole mass is again churned for an hour and a half, or longer, until the casein is well divided, and small bubbles appear on the surface of the fluid. Then the mixture, after having stood for half an hour, has a fresh bottle of milk added to it, and the stirring is again renewed, with short intervals, until the koumiss is ready, which usually

happens by 10 o'clock P.M., if its preparation was commenced at 8 A.M. The approaching completion of the koumiss is known by a thick froth, which sometimes rises very high, forming on its surface; while the full completion of fermentation is recognised by a falling of the froth, and by certain signs detectable by the ear and hand; the process of churning becomes easier, and the splash of the drops during agitation presents a clearer and more metallic sound. The koumiss is then poured into champagne - bottles, well corked, and left for the night at a room temperature (from 60° to 70° Fahr.) Towards morning the koumiss is quite fit for use. Left in bottle till the next day it becomes stronger, but is still drinkable; while if placed in a cold room, it may be used even on the fifth day. In order that the preparation of koumiss may be carried on successfully, it will be necessary to put aside two bottles of the koumiss first prepared, and to keep them for from three to four days, so as always to have a bottle of four-days-old koumiss in store for fermenting new portions of milk, and of replacing the used bottles by new ones. Thus the preparation of this kind of fermented milk is simple enough, although it requires practice. Failure is sometimes caused by too energetic, at others by insufficient, churning; while

occasionally the milk itself is at fault. To speed the preparation of koumiss, the churn is sometimes placed in a heated stove, or half-a-dozen raisins are added to the mixture. Sometimes the koumiss is very soon ready, and then it is very sour, and contains curdled casein. In such a case it is necessary to steam and dry the churn, or to lessen the quantity or the strength of the ferment, or, instead of lessening the ferment, to place a larger amount of milk or water into the churn. A bitter taste in the koumiss shows either that cleanliness was not attended to in its preparation, or that the milk was too rich. To avoid a repetition of the accident, the milk is very carefully skimmed, or the butter is carefully separated from it if it has been previously churned without the addition of a ferment. In domestic economy, it is highly profitable to prepare butter and koumiss at the same time. When the cause of failure cannot be detected, it is best to change the milk, and to recommence the process of fermentation with a newly prepared ferment.

“When there is no natural ferment at hand, it is artificially prepared in the following manner: Two table-spoonfuls of brewer’s yeast, two spoonfuls of millet-flour, and a spoonful of honey, are kneaded into a paste; this is wrapped into a piece of gauze

or muslin, and placed into a jug of unskimmed milk, and left for the night in a warm place.

“This soured and fermented milk is poured into the churn when no old koumiss can be obtained, but the mixture is afterwards treated in the way already pointed out, with this difference only—that it takes a longer time before the whole of it gets converted into koumiss: thus, if fermentation is started in the morning, it is completed only on the evening of the following day. Subsequently, three-days-old koumiss, made as above, should serve as the ferment for the daily preparation of fresh portions of koumiss. Such a process is only suited for the preparation of small quantities of fermented cow’s milk—not more than five bottles daily. Where ten are needed, we shall have to use double the amount of ferment. In preparing koumiss on a large scale, the churn may be replaced by a revolving barrel, such as is used for the preparation of butter, with perforated compartments. With such an apparatus one person could prepare koumiss from thin milk for ten patients daily; the article will prove easier of digestion, and more nourishing than milk. I have enlarged upon this method of fermenting cow’s milk, because of the ease of its preparation and the cheapness of the material employed, and because I consider that for

poor people it is the best substitute for koumiss. And it is the poor, after all, who stand most in need of a stimulating, strengthening, and nourishing remedy. Its qualities closely resemble those of fermented mare's milk; the easy digestibility of this pleasant, cooling beverage may serve to spread its employment in those cases where real koumiss is prescribed. My observations on sick patients who used fermented cow's milk have led me to the conclusion, firstly, that it is much easier of digestion than milk; secondly, that its physiological action on the body is the same as that of koumiss."¹

Dr Polubensky, it should be remembered, however, wrote at a time when the great differences between cow's and mare's milk were unknown to chemists. That he himself preferred the climate of the steppes, and the drinking of fermented mare's instead of cow's milk, is proved by the fact that for many summers in succession he repaired from Northern Russia to Samara, and spent several months at Dr Postnikof's.

Dr Levshin has found the following preparation of cow's milk answer admirably in his practice:—

"Eighteen ounces of milk-sugar are dissolved in three quarts of water. One quart of this sweet-

¹ *Op. cit.*, pp. 9, 10. October 1865.

ened water is mixed with three quarts of carefully skimmed, but not sour, milk (I prefer to use milk that has stood over night), and then half or a whole quart of koumiss (either cow's or mare's) is added thereto.¹ This fermenting mixture is left in a temperature of from 60° to 70° Fahr. for from six to eight hours, until small bubbles of carbonic acid appear on its surface. Then the two remaining quarts of the saccharine solution, along with six quarts of properly skimmed milk, are added. The whole mass must then be beaten up—the more the better. The churning should be continued, at intervals of an hour, for from fifteen to twenty minutes, during twenty-four hours, and at an equable temperature of from 65° to 75° Fahr. Any butter-making machine (provided it has not been used before) may be employed for the purpose. I use an oak cylinder, conical at the top, with a staff passing through its cover. The staff at its lower extremity has two crucially placed flat pieces of oak attached to it. It is necessary, before pouring the koumiss into bottles, to beat it up for a whole hour. In case the casein falls in thick lumps to the bottom of the vessel—a

¹ The koumiss may be prepared in one of the ways referred to in a former chapter, or according to Dr Polubensky's method above narrated.

rare occurrence—it should be filtered through a very fine sieve, and then beaten up again for twenty minutes. At last the koumiss is poured into bottles, but not quite full. The bottles are then carefully corked, and the cork tied down with a string, as in soda-water bottles. The filled bottles must be kept from six to eight hours at a temperature of from 65° to 75° Fahr. before they are removed to a cool place. It may happen that the casein soon falls in thick lumps to the bottom of the bottle—a rare accident, however. The bottles in such a case must be uncorked, the koumiss filtered through a sieve, beaten up for twenty minutes, and then re-bottled. It must be noted that cow koumiss, as a rule, exhibits little carbonic acid the first day after it has been bottled, and hence it is not so palatable as two or three days old koumiss. After five days it is so sour as to be unfit for use.”¹

Dr Levshin advises the use of the spiral tap when using koumiss. He found that patients could drink from three to six bottles of fermented cow's milk per day—certainly an extraordinarily large quantity. It will be observed, however, that both these authors apply the name of koumiss indiscriminately to fer-

¹ Berliner Klinische Wochenschrift, No. 39, pp. 487, 488. 1874.

mented mare's and to fermented cow's milk. I consider that it would prevent much confusion, besides being more just and correct, to confine the name of koumiss to fermented mare's milk; and to apply the term *galazyme* or *galactozyme*, as suggested by Dr Schnepp, to fermented cow's milk, whether pure or mixed.

THE END.

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